

1. 2次関数のグラフについて、グラフとx軸との共有点のx座標，x軸との共有点の個数，x軸との位置関係を求めなさい。

Find the x-coordinate of common points, the number of common points, the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = -0.5x^2$</p> <p>$-0.5x^2 = 0$ $x^2 = 0$ ↘ $\div (-0.5)$</p> <p><u>$x = 0$</u></p> <p><u>共有点は1個</u> 1 common point</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>① $y = 0.25x^2$</p>
<p>② $y = x^2 + 3x + 2$</p> <p>$x^2 + 3x + 2 = 0$ 1+2 1×2</p> <p>$(x + 1)(x + 2) = 0$</p> <p><u>$x = -1, -2$</u></p> <p><u>共有点は2個</u> 2 common points</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>② $y = x^2 + 5x + 4$</p>
<p>③ $y = x^2 + 4x + 4$</p> <p>$x^2 + 4x + 4 = 0$ 2+2 2×2</p> <p>$(x + 2)^2 = 0$</p> <p><u>$x = -2$</u></p> <p><u>共有点は1個</u> 1 common point</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>③ $y = x^2 + 6x + 9$</p>
<p>⑤ $y = x^2 - 16$</p> <p>$x^2 - 16 = 0$</p> <p>$(x + 4)(x - 4) = 0$</p> <p><u>$x = -4, 4$</u></p> <p><u>共有点は2個</u> 2 common points</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = x^2 - 1$</p>

2. 判別式Dを用いて、2次関数のグラフとx軸との共有点の個数，x軸との位置関係を求めよ。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$ $\begin{cases} D > 0 \cdots 2 \text{ 個} \\ D = 0 \cdots 1 \text{ 個} \\ D < 0 \cdots 0 \text{ 個} \end{cases}$

Find the the number of common points, the positional relationship between the graph of the following quadratic function and the x-axis using the discriminant D.

例題	問題
<p>① $y = x^2 + 4x + 3$ $a = 1, b = 4, c = 3$</p> <p>$D = 4^2 - 4 \times 1 \times 3$ $= 4 > 0$</p> <p><u>共有点は2個</u> 2 common points</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>① $y = x^2 + 5x + 6$</p>
<p>② $y = x^2 - 6x + 9$ $a = 1, b = -6, c = 9$</p> <p>$D = (-6)^2 - 4 \times 1 \times 9$ $= 0$</p> <p><u>共有点は1個</u> 1 common point</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>② $y = x^2 - 4x + 4$</p>
<p>③ $y = x^2 + 4x + 5$ $a = 1, b = 4, c = 5$</p> <p>$D = 4^2 - 4 \times 1 \times 5$ $= -4 < 0$</p> <p><u>共有点は0個</u> zero common point</p> <p><u>共有点をもたない</u> no common point</p>	<p>③ $y = x^2 + 6x + 10$</p>
<p>④ $y = x^2 - 4$ $a = 1, b = 0, c = -4$</p> <p>$D = 0^2 - 4 \times 1 \times (-4)$ $= 16 > 0$</p> <p><u>共有点は2個</u> 2 common points</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>④ $y = x^2 - 25$</p>
<p>⑤ $y = 3x^2 - 4x + 1$ $a = 3, b = -4, c = 1$</p> <p>$D = (-4)^2 - 4 \times 3 \times 1$ $= 4 > 0$</p> <p><u>共有点は2個</u> 2 common points</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = 2x^2 - 3x + 1$</p>

1. 2次関数のグラフについて、グラフとx軸との共有点のx座標，x軸との共有点の個数，x軸との位置関係を求めなさい。

Find the x-coordinate of common points, the number of common points, the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = x^2 + 4x + 3$</p> <p>$x^2 + 4x + 3 = 0$ 1+3 1×3</p> <p>$(x + 1)(x + 3) = 0$</p> <p><u>$x = -1, -3$</u></p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>① $y = x^2 + 6x + 5$</p>
<p>② $y = x^2 + 10x + 25$</p> <p>$x^2 + 10x + 25 = 0$ 5+5 5×5</p> <p>$(x + 5)^2 = 0$</p> <p><u>$x = -5$</u></p> <p>共有点は1個 1 common point</p> <p>1点で接する touch at 1 point</p>	<p>② $y = x^2 + 2x + 1$</p>
<p>③ $y = x^2 - 2x$</p> <p><u>$x^2 - 2x = 0$</u></p> <p>$x(x - 2) = 0$</p> <p><u>$x = 0, 2$</u></p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>③ $y = x^2 - 4x$</p>
<p>④ $y = x^2 - 36$</p> <p>$x^2 - 36 = 0$</p> <p>$(x + 6)(x - 6) = 0$</p> <p><u>$x = -6, 6$</u></p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>④ $y = x^2 - 25$</p>

2. 判別式Dを用いて、2次関数のグラフとx軸との共有点の個数，x軸との位置関係を求めよ。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$ $\begin{cases} D > 0 \cdots 2 \text{ 個} \\ D = 0 \cdots 1 \text{ 個} \\ D < 0 \cdots 0 \text{ 個} \end{cases}$

Find the the number of common points, the positional relationship between the graph of the following quadratic function and the x-axis using the discriminant D.

例題	問題
<p>① $y = x^2 + 5x + 4$ $a = 1, b = 5, c = 4$</p> <p>$D = 5^2 - 4 \times 1 \times 4$ $= 9 > 0$</p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>① $y = x^2 + 3x + 2$</p>
<p>② $y = x^2 - 8x + 16$ $a = 1, b = -8, c = 16$</p> <p>$D = (-8)^2 - 4 \times 1 \times 16$ $= 0$</p> <p>共有点は1個 1 common point</p> <p>1点で接する touch at 1 point</p>	<p>② $y = x^2 - 6x + 9$</p>
<p>③ $y = x^2 + 6x + 10$ $a = 1, b = 6, c = 10$</p> <p>$D = 6^2 - 4 \times 1 \times 10$ $= -4 < 0$</p> <p>共有点は0個 zero common point</p> <p>共有点をもたない no common point</p>	<p>③ $y = x^2 + 4x + 6$</p>
<p>④ $y = x^2 - 9$ $a = 1, b = 0, c = -9$</p> <p>$D = 0^2 - 4 \times 1 \times (-9)$ $= 36 > 0$</p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>④ $y = x^2 - 1$</p>
<p>⑤ $y = 2x^2 - 5x + 2$ $a = 2, b = -5, c = 2$</p> <p>$D = (-5)^2 - 4 \times 2 \times 2$ $= 9 > 0$</p> <p>共有点は2個 2 common points</p> <p>2点で交わる intersect at 2 different points</p>	<p>⑤ $y = 3x^2 - 10x + 3$</p>

1. 次の2次関数のグラフとx軸との共有点の個数を求めよ。 ※0個, 1個, 2個

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = 2x^2$</p> <p>$2x^2 = 0$</p> <p>$x = 0$ より <u>1個</u> 1 common point</p>	<p>① $y = 3x^2$</p>
<p>② $y = x^2 + 4x$</p> <p>$x^2 + 4x = 0$</p> <p>$x(x + 4) = 0$</p> <p>$x = 0, -4$ より <u>2個</u> 2 common points</p>	<p>② $y = x^2 + 2x$</p>
<p>③ $y = x^2 + 4x + 3$</p> <p>$x^2 + 4x + 3 = 0$</p> <p>$(x + 1)(x + 3) = 0$</p> <p>$x = -1, -3$ より <u>2個</u> 2 common points</p>	<p>③ $y = x^2 + 2x - 3$</p>
<p>④ $y = x^2 + 4x + 4$</p> <p>$x^2 + 4x + 4 = 0$</p> <p>$(x + 2)^2 = 0$</p> <p>$x = -2$ より <u>1個</u> 2 common points</p>	<p>④ $y = x^2 + 2x + 1$</p>
<p>⑤ $y = x^2 + 4x + 5$</p> <p>$x^2 + 4x + 5 = 0$</p> <p>$(x + 2)^2 + 1 = 0$</p> <p>解なし より <u>0個</u> zero common point</p> <p>別解</p> <p>$D = 4^2 - 4 \times 1 \times 5$</p> <p>$= -4 < 0$</p> <p>解なし より <u>0個</u> zero common point</p>	<p>⑤ $y = x^2 + 2x + 3$</p>

2. 次の2次関数のグラフとx軸との位置関係を求めよ。 ※異なる2点で交わる, 1点で接する, 共有点なし

Find the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = 4x^2$</p> <p>$4x^2 = 0$</p> <p>$x = 0$ より</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>① $y = -x^2$</p>
<p>② $y = x^2 - 3x$</p> <p>$x^2 - 3x = 0$</p> <p>$x(x - 3) = 0$</p> <p>$x = 0, 3$ より</p> <p><u>異なる2点で交わる</u> intersect at 2 different points</p>	<p>② $y = x^2 - 5x$</p>
<p>③ $y = x^2 + 3x + 1$</p> <p>$x^2 + 3x + 1 = 0$</p> <p>$D = 3^2 - 4 \times 1 \times 1$</p> <p>$= 5 > 0$より</p> <p><u>異なる2点で交わる</u> intersect at 2 different points</p>	<p>③ $y = x^2 + 5x + 4$</p>
<p>④ $y = x^2 + 6x + 9$</p> <p>$x^2 + 6x + 9 = 0$</p> <p>$(x + 3)^2 = 0$</p> <p>$x = -3$ より</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>④ $y = x^2 - 10x + 25$</p>
<p>⑤ $y = x^2 + 6x + 10$</p> <p>$x^2 + 6x + 10 = 0$</p> <p>$(x + 3)^2 + 1 = 0$</p> <p>解なしより <u>共有点なし</u> no common point</p> <p>別解</p> <p>$D = 6^2 - 4 \times 1 \times 10$</p> <p>$= -4 < 0$</p> <p>解なしより <u>共有点なし</u> no common point</p>	<p>⑤ $y = x^2 - 4x + 6$</p>

1. 次の2次関数のグラフとx軸との共有点の個数を求めよ。 ※0個, 1個, 2個

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = 3x^2$</p> <p>$3x^2 = 0$</p> <p>$x = 0$ より <u>1個</u> 1 common point</p>	<p>① $y = 4x^2$</p>
<p>② $y = x^2 - 4x$</p> <p>$x^2 - 4x = 0$</p> <p>$x(x - 4) = 0$</p> <p>$x = 0, 4$ より <u>2個</u> 2 common points</p>	<p>② $y = x^2 - 2x$</p>
<p>③ $y = x^2 - 5x + 4$</p> <p>$x^2 - 5x + 4 = 0$</p> <p>$(x - 1)(x - 4) = 0$</p> <p>$x = 1, 4$ より <u>2個</u> 2 common points</p>	<p>③ $y = x^2 - 4x + 3$</p>
<p>④ $y = x^2 + 6x + 9$</p> <p>$x^2 + 6x + 9 = 0$</p> <p>$(x + 3)^2 = 0$</p> <p>$x = -3$ より <u>1個</u> 1 common point</p>	<p>④ $y = x^2 + 4x + 4$</p>
<p>⑤ $y = x^2 + 2x + 5$</p> <p>$x^2 + 2x + 5 = 0$</p> <p>$(x + 1)^2 + 4 = 0$</p> <p>解なし より <u>0個</u> zero common point</p> <p>別解</p> <p>$D = 2^2 - 4 \times 1 \times 5$</p> <p>$= -16 < 0$</p> <p>解なし より <u>0個</u> zero common point</p>	<p>⑤ $y = x^2 + 4x + 5$</p>

2. 次の2次関数のグラフとx軸との位置関係を求めよ。 ※異なる2点で交わる, 1点で接する, 共有点なし

Find the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = -x^2$</p> <p>$-x^2 = 0$</p> <p>$x = 0$ より</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>① $y = 2x^2$</p>
<p>② $y = x^2 + 5x$</p> <p>$x^2 + 5x = 0$</p> <p>$x(x + 5) = 0$</p> <p>$x = 0, -5$ より</p> <p><u>異なる2点で交わる</u> intersect at 2 different points</p>	<p>② $y = x^2 + 3x$</p>
<p>③ $y = x^2 - 4x - 5$</p> <p>$x^2 - 4x - 5 = 0$</p> <p>$(x + 1)(x - 5) = 0$</p> <p>$x = -1, 5$ より</p> <p><u>異なる2点で交わる</u> intersect at 2 different points</p>	<p>③ $y = x^2 - 2x - 3$</p>
<p>④ $y = 4x^2 + 4x + 1$</p> <p>$4x^2 + 4x + 1 = 0$</p> <p>$D = 4^2 - 4 \times 4 \times 1$</p> <p>$= 0$ より</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>④ $y = 9x^2 + 6x + 1$</p>
<p>⑤ $y = x^2 - 4x + 6$</p> <p>$x^2 - 4x + 6 = 0$</p> <p>$(x - 2)^2 + 2 = 0$</p> <p>解なしより <u>共有点なし</u> no common point</p> <p>別解</p> <p>$D = (-4)^2 - 4 \times 1 \times 6$</p> <p>$= -8 < 0$</p> <p>解なしより <u>共有点なし</u> no common point</p>	<p>⑤ $y = x^2 - 2x + 3$</p>

1. 次の式の値を求めよ。 Find the value of the following expression.

例題① 「 $x = 0$ のとき」	問題① 「 $x = 0$ のとき」
(1) $x + 2 = 0 + 2 = 2$	(1) $x + 3$
(2) $x - 2 = 0 - 2 = -2$	(2) $x - 3$
(3) $2x = 2 \times 0 = 0$	(3) $3x$

例題② 「 $x = 2$ のとき」	問題② 「 $x = 3$ のとき」
(1) $x + 2 = 2 + 2 = 4$	(1) $x + 3$
(2) $x - 2 = 2 - 2 = 0$	(2) $x - 3$
(3) $2x = 2 \times 2 = 4$	(3) $3x$

例題③ 「 $x = -2$ のとき」	問題③ 「 $x = -3$ のとき」
(1) $x + 2 = -2 + 2 = 0$	(1) $x + 3$
(2) $x - 2 = -2 - 2 = -4$	(2) $x - 3$
(3) $2x = 2 \times (-2) = -4$	(3) $3x$

2. 次の一次方程式を解きなさい。※ $x = \cdots$ の形で書く。 Solve the following linear equations. ※Write in the form of “ $x = \dots$ ”

例題	問題
① $x + 2 = 0$ $x = 0 - 2$ $x = -2$	① $x + 3 = 0$
② $x - 2 = 0$ $x = 0 + 2$ $x = 2$	② $x - 3 = 0$
③ $2x = 0$ $x = 0 \div 2$ $x = 0$	③ $3x = 0$

3. 次の式を展開しなさい。 Expand the following expression.

例題	問題
① $2(x + 4)$ $= 2 \times x + 2 \times 4$ $= 2x + 8$	① $2(x + 3)$
② $x(x - 2)$ $= x \times x + x \times (-2)$ $= x^2 - 2x$	② $x(x - 3)$
③ $(x + 3)(x + 1)$ $= x \times x + x \times 1 + 3 \times x + 3 \times 1$ $= x^2 + 4x + 3$	③ $(x + 2)(x + 3)$
④ $(x + 3)(x - 1)$ $= x \times x + x \times (-1) + 3 \times x + 3 \times (-1)$ $= x^2 + 2x - 3$	④ $(x + 4)(x - 1)$
⑤ $(x - 3)(x + 2)$ $= x^2 + (-3 + 2)x + (-3) \times 2$ $= x^2 - x - 6$	⑤ $(x - 4)(x + 3)$
⑥ $(x - 3)(x + 3)$ $= x^2 + (-3 + 3)x + (-3) \times 3$ $= x^2 - 9$	⑥ $(x - 4)(x + 4)$

4. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。 ※x軸は $y = 0$

Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = 2x^2$ $2x^2 = 0$ $x^2 = 0$ <u>$x = 0$</u>	① $y = 3x^2$
② $y = (x - 1)(x - 2)$ $(x - 1)(x - 2) = 0$ <u>$x = 1, 2$</u>	② $y = (x - 1)(x - 3)$
③ $y = (x + 1)(x - 2)$ $(x + 1)(x - 2) = 0$ <u>$x = -1, 2$</u>	③ $y = (x + 1)(x - 3)$
④ $y = x(x - 2)$ $x(x - 2) = 0$ <u>$x = 0, 2$</u>	④ $y = x(x - 3)$
⑤ $y = x^2 + 4x + 3$ $x^2 + 4x + 3 = 0$ $(x + 1)(x + 3) = 0$ <u>$x = -1, -3$</u>	⑤ $y = x^2 + 5x + 6$
⑥ $y = x^2 - 2x$ $x^2 - 2x = 0$ $x(x - 2) = 0$ <u>$x = 0, 2$</u>	⑥ $y = x^2 - 3x$
⑦ $y = x^2 - 9$ $x^2 - 9 = 0$ $(x - 3)(x + 3) = 0$ <u>$x = 3, -3$</u>	⑦ $y = x^2 - 16$
⑧ $y = x^2 + 2x - 3$ $x^2 + 2x - 3 = 0$ $(x - 1)(x + 3) = 0$ <u>$x = 1, -3$</u>	⑧ $y = x^2 + 3x - 4$
⑨ $y = x^2 - 6x + 5$ $x^2 - 6x + 5 = 0$ $(x - 1)(x - 5) = 0$ <u>$x = 1, 5$</u>	⑨ $y = x^2 - 7x + 6$

1. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。

※x軸はy=0

Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = 2x^2$ $2x^2 = 0$ $x^2 = 0$ <u>$x = 0$</u>	① $y = 3x^2$
② $y = (x - 1)(x - 2)$ $(x - 1)(x - 2) = 0$ <u>$x = 1, 2$</u>	② $y = (x - 1)(x - 3)$
③ $y = (x + 3)(x - 2)$ $(x + 3)(x - 2) = 0$ <u>$x = -3, 2$</u>	③ $y = (x + 1)(x - 3)$
④ $y = (x + 3)(x + 2)$ $(x + 3)(x + 2) = 0$ <u>$x = -3, -2$</u>	④ $y = (x + 1)(x + 4)$
⑤ $y = 2(x + 1)(x + 3)$ $2(x + 1)(x + 3) = 0$ <u>$x = -1, -3$</u>	⑤ $y = 3(x + 2)(x - 1)$
⑥ $y = x(x + 2)$ $x(x + 2) = 0$ <u>$x = 0, -2$</u>	⑥ $y = x(x + 4)$
⑦ $y = x(x - 4)$ $x(x - 4) = 0$ <u>$x = 0, 4$</u>	⑦ $y = x(x - 1)$
⑧ $y = -x(x - 3)$ $-x(x - 3) = 0$ <u>$x = 0, 3$</u>	⑧ $y = -x(x - 6)$
⑨ $y = (2x - 1)(x + 1)$ $(2x - 1)(x + 1) = 0$ <u>$x = \frac{1}{2}, -1$</u>	⑨ $y = (2x - 1)(x + 2)$
⑩ $y = (2x - 3)(x + 1)$ $(2x - 3)(x + 1) = 0$ <u>$x = \frac{3}{2}, -1$</u>	⑩ $y = (2x + 3)(x + 2)$

2. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。

※x軸はy=0

Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = x^2 + 4x + 3$ $x^2 + 4x + 3 = 0$ $\quad \quad \quad 1+3 \quad 1 \times 3$ $(x + 1)(x + 3) = 0$ <u>$x = -1, -3$</u>	① $y = x^2 + 6x + 5$
② $y = x^2 - 5x + 4$ $x^2 - 5x + 4 = 0$ $\quad \quad \quad (-1)+(-4) \quad (-1) \times (-4)$ $(x - 1)(x - 4) = 0$ <u>$x = 1, 4$</u>	② $y = x^2 - 4x + 3$
③ $y = x^2 - 3x - 4$ $x^2 - 3x - 4 = 0$ $\quad \quad \quad (-4)+1 \quad (-4) \times 1$ $(x - 4)(x + 1) = 0$ <u>$x = 4, -1$</u>	③ $y = x^2 - 2x - 3$
④ $y = x^2 + 4x + 4$ $x^2 + 4x + 4 = 0$ $\quad \quad \quad 2+2 \quad 2 \times 2$ $(x + 2)^2 = 0$ <u>$x = -2$</u>	④ $y = x^2 + 2x + 1$
⑤ $y = x^2 + 3x$ $\underline{x^2} + 3\underline{x} = 0$ $x(x + 3) = 0$ <u>$x = 0, -3$</u>	⑤ $y = x^2 + 2x$

3. 次の放物線のグラフとx軸との共有点がないことを示せ。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

Show that there is no intersection of the following parabola with the x-axis.

例題	問題
① $y = x^2 - 2x + 3$ $\quad \quad \quad \downarrow \div 2$ $\quad \quad \quad = (x - 1)^2 + 2$ $\text{頂点}(1, 2) \quad \quad \quad \curvearrowright$	① $y = x^2 - 4x + 5$
② $y = x^2 + 2x + 3$ $D = 2^2 - 4 \times 1 \times 3$ $\quad \quad \quad = -8 < 0 \quad \text{解なし}$	② $y = x^2 + 4x + 5$

1. 次の式の値を求めよ。 Find the value of the following expression.

例題① 「 $x = 0$ のとき」	問題① 「 $x = 0$ のとき」
(1) $x + 4 = 0 + 4 = 4$	(1) $x + 5$
(2) $x - 4 = 0 - 4 = -4$	(2) $x - 5$
(3) $-4x = -4 \times 0 = 0$	(3) $-5x$

例題② 「 $x = -4$ のとき」	問題② 「 $x = -5$ のとき」
(1) $x + 4 = -4 + 4 = 0$	(1) $x + 5$
(2) $x - 4 = -4 - 4 = -8$	(2) $x - 5$
(3) $4x = 4 \times (-4) = -16$	(3) $5x$

例題③ 「 $x = 4$ のとき」	問題③ 「 $x = 5$ のとき」
(1) $x + 4 = 4 + 4 = 8$	(1) $x + 5$
(2) $x - 4 = 4 - 4 = 0$	(2) $x - 5$
(3) $4x = 4 \times 4 = 16$	(3) $5x$

2. 次の一次方程式を解きなさい。※ $x = \cdots$ の形で書く。 Solve the following linear equations. ※Write in the form of “ $x = \dots$ ”

例題	問題
① $x + 4 = 0$ $x = 0 - 4$ $x = -4$	① $x + 5 = 0$
② $x - 4 = 0$ $x = 0 + 4$ $x = 4$	② $x - 5 = 0$
③ $4x = 0$ $x = 0 \div 4$ $x = 0$	③ $5x = 0$

3. 次の式を展開しなさい。 Expand the following expression.

例題	問題
① $3(x + 4)$ $= 3 \times x + 3 \times 4$ $= 3x + 12$	① $3(x + 5)$
② $x(x - 4)$ $= x \times x + x \times (-4)$ $= x^2 - 4x$	② $x(x - 5)$
③ $(x - 4)(x + 1)$ $= x \times x + x \times 1 - 4 \times x - 4 \times 1$ $= x^2 - 3x - 4$	③ $(x - 5)(x + 1)$
④ $(x + 2)(x - 4)$ $= x \times x + x \times (-4) + 2 \times x + 2 \times (-4)$ $= x^2 - 2x - 8$	④ $(x + 2)(x - 5)$
⑤ $(x - 4)(x - 3)$ $= x^2 + (-4 - 3)x + (-4) \times (-3)$ $= x^2 - 7x + 12$	⑤ $(x - 5)(x - 2)$
⑥ $(x - 4)(x + 4)$ $= x^2 + (-4 + 4)x + (-4) \times 4$ $= x^2 - 16$	⑥ $(x - 5)(x + 5)$

4. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。 ※x軸は $y = 0$ Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = -2x^2$ $-2x^2 = 0$ $x^2 = 0$ <u>$x = 0$</u>	① $y = -3x^2$
② $y = x(x - 4)$ $x(x - 4) = 0$ <u>$x = 0, 4$</u>	② $y = x(x - 5)$
③ $y = (x + 1)(x - 4)$ $(x + 1)(x - 4) = 0$ <u>$x = -1, 4$</u>	③ $y = (x + 1)(x - 5)$
④ $y = (x + 3)(x + 4)$ $(x + 3)(x + 4) = 0$ <u>$x = -3, -4$</u>	④ $y = (x + 1)(x + 5)$
⑤ $y = x^2 + 5x + 4$ $x^2 + 5x + 4 = 0$ $(x + 1)(x + 4) = 0$ <u>$x = -1, -4$</u>	⑤ $y = x^2 + 6x + 5$
⑥ $y = x^2 + 4x$ $x^2 + 4x = 0$ $x(x + 4) = 0$ <u>$x = 0, -4$</u>	⑥ $y = x^2 + 5x$
⑦ $y = x^2 - 16$ $x^2 - 16 = 0$ $(x - 4)(x + 4) = 0$ <u>$x = 4, -4$</u>	⑦ $y = x^2 - 25$
⑧ $y = x^2 - 3x - 4$ $x^2 - 3x - 4 = 0$ $(x - 1)(x + 3) = 0$ <u>$x = 1, -3$</u>	⑧ $y = x^2 - 4x - 5$
⑨ $y = x^2 - 7x + 12$ $x^2 - 7x + 12 = 0$ $(x - 3)(x - 4) = 0$ <u>$x = 3, 4$</u>	⑨ $y = x^2 - 7x + 10$

1. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。

※x軸はy=0

Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = -2x^2$ $-2x^2 = 0$ $x^2 = 0$ <u>$x = 0$</u>	① $y = -4x^2$
② $y = (x - 2)(x - 3)$ $(x - 2)(x - 3) = 0$ <u>$x = 2, 3$</u>	② $y = (x - 2)(x - 4)$
③ $y = (x + 2)(x - 3)$ $(x + 2)(x - 3) = 0$ <u>$x = -2, 3$</u>	③ $y = (x + 1)(x - 4)$
④ $y = (x + 2)(x + 3)$ $(x + 2)(x + 3) = 0$ <u>$x = -2, -3$</u>	④ $y = (x + 1)(x + 5)$
⑤ $y = 2(x + 1)(x + 2)$ $2(x + 1)(x + 2) = 0$ <u>$x = -1, -2$</u>	⑤ $y = 3(x + 3)(x - 1)$
⑥ $y = x(x + 5)$ $x(x + 5) = 0$ <u>$x = 0, -5$</u>	⑥ $y = x(x + 6)$
⑦ $y = x(x - 6)$ $x(x - 6) = 0$ <u>$x = 0, 6$</u>	⑦ $y = x(x - 2)$
⑧ $y = -x(x + 3)$ $-x(x + 3) = 0$ <u>$x = 0, -3$</u>	⑧ $y = -x(x + 6)$
⑨ $y = (2x - 1)(x + 2)$ $(2x - 1)(x + 2) = 0$ <u>$x = \frac{1}{2}, -2$</u>	⑨ $y = (2x - 1)(x + 3)$
⑩ $y = (2x - 3)(x - 2)$ $(2x - 3)(x - 2) = 0$ <u>$x = \frac{3}{2}, 2$</u>	⑩ $y = (2x + 3)(x - 2)$

2. 次の2次関数のグラフとx軸との共有点のx座標を求めなさい。

※x軸はy=0


Find the x-coordinate of the common point between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = x^2 + 6x + 5$ $x^2 + 6x + 5 = 0$ $\quad \quad \quad 1+5 \quad 1 \times 5$ $(x + 1)(x + 5) = 0$ <u>$x = -1, -5$</u>	① $y = x^2 + 7x + 6$
② $y = x^2 - 4x + 3$ $x^2 - 4x + 3 = 0$ $\quad \quad \quad (-1)+(-3) \quad (-1) \times (-3)$ $(x - 1)(x - 3) = 0$ <u>$x = 1, 3$</u>	② $y = x^2 - 3x + 2$
③ $y = x^2 + 3x - 4$ $x^2 + 3x - 4 = 0$ $\quad \quad \quad (-1)+4 \quad (-1) \times 4$ $(x - 1)(x + 4) = 0$ <u>$x = 1, -4$</u>	③ $y = x^2 + 2x - 3$
④ $y = x^2 + 14x + 49$ $x^2 + 14x + 49 = 0$ $\quad \quad \quad 7+7 \quad 7 \times 7$ $(x + 7)^2 = 0$ <u>$x = -7$</u>	④ $y = x^2 + 4x + 4$
⑤ $y = x^2 + 6x$ $x^2 + 6x = 0$ $x(x + 6) = 0$ <u>$x = 0, -6$</u>	⑤ $y = x^2 + 3x$

3. 次の放物線のグラフとx軸との共有点がないことを示せ。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

Show that there is no intersection of the following parabola with the x-axis.

例題	問題
① $y = x^2 - 4x + 7$ $\quad \quad \quad \downarrow \div 2$ $\quad \quad \quad = (x - 2)^2 + 3$ <div>頂点(2, 3) </div>	① $y = x^2 - 2x + 3$
② $y = x^2 + x + 1$ $D = 1^2 - 4 \times 1 \times 1$ $\quad \quad \quad = -3 < 0$ 解なし	② $y = x^2 + x + 2$

1. 次の一次方程式を解きなさい。※ $x = \cdots$ の形で書く。
Solve the following linear equations. ※Write in the form of " $x = \cdots$ "

例題	問題
① $x + 4 = 0$ $x = -4$	① $x + 2 = 0$
② $x - 4 = 0$ $x = 4$	② $x - 2 = 0$
③ $4x = 0$ $x = 0$	③ $2x = 0$

2. 次の2次方程式を解きなさい。
Solve the quadratic equation. ※Write in the form of " $x = \cdots, \cdots$ "

例題	問題
① $2x^2 = 0$ $x^2 = 0$ <u>$x = 0$ (重解)</u>	① $3x^2 = 0$
② $(x + 4)^2 = 0$ <u>$x = -4$ (重解)</u>	② $(x + 3)^2 = 0$
③ $(x + 4)(x - 3) = 0$ <u>$x = -4, 3$</u>	③ $(x + 2)(x - 1) = 0$
④ $x(x + 2) = 0$ <u>$x = 0, -2$</u>	④ $x(x + 3) = 0$
⑤ $(x + 2)^2 + 1 = 0$ $(x + 2)^2 \geq 0$ より <u>解なし</u> no solution	⑤ $(x + 3)^2 + 1 = 0$

3. 次の式を展開しなさい。
Expand the following expression.

例題	問題
① $x(x + 4)$ $= x \times x + x \times 4$ $= x^2 + 4x$	① $x(x + 3)$
② $(x + 3)(x + 4)$ $= x^2 + (3 + 4)x + 3 \times 4$ $= x^2 + 7x + 12$	② $(x + 3)(x + 2)$
③ $(x + 3)(x - 4)$ $= x^2 + (3 - 4)x + 3 \times (-4)$ $= x^2 - x - 12$	③ $(x + 3)(x - 2)$
④ $(x - 3)(x - 4)$ $= x^2 + (-3 - 4)x + (-3) \times (-4)$ $= x^2 - 7x + 12$	④ $(x - 3)(x - 2)$
⑤ $(x - 4)(x + 4)$ $= x^2 + (-4 + 4)x + (-4) \times 4$ $= x^2 - 16$	⑤ $(x - 3)(x + 3)$

4. 次の2次関数のグラフとx軸との共有点の個数を求めなさい。
※x軸は $y = 0$

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = 2x^2$ $2x^2 = 0$ 共有点は1個 1 common point	① $y = 3x^2$
② $y = (x + 4)^2$ $(x + 4)^2 = 0$ 共有点は1個 1 common point	② $y = (x + 3)^2$
③ $y = (x + 4)(x - 3)$ $(x + 4)(x - 3) = 0$ 共有点は2個 2 common points	③ $y = (x + 2)(x - 1)$
④ $y = x(x + 2)$ $x(x + 2) = 0$ 共有点は2個 2 common points	④ $y = x(x + 3)$
⑤ $y = (x + 2)^2 + 1$ $(x + 2)^2 + 1 = 0$ 共有点は0個 zero common point	⑤ $y = (x + 3)^2 + 1$
⑥ $y = x^2 + 4x$ $x^2 + 4x = 0$ $x(x + 4) = 0$ 共有点は2個 2 common points	⑥ $y = x^2 + 3x$
⑦ $y = x^2 + 7x + 12$ $x^2 + 7x + 12 = 0$ $(x + 3)(x + 4) = 0$ 共有点は2個 2 common points	⑦ $y = x^2 + 5x + 6$
⑧ $y = x^2 - 9$ $x^2 - 9 = 0$ $(x - 3)(x + 3) = 0$ 共有点は2個 2 common points	⑧ $y = x^2 - 1$
⑨ $y = x^2 + 4x + 6$ $x^2 + 4x + 6 = 0$ $(x + 2)^2 + 2 = 0$ 共有点は0個 zero common point ※ $D = 4^2 - 4 \times 1 \times 6 < 0$	⑨ $y = x^2 + 2x + 3$

1. 次の2次関数のグラフとx軸との共有点の個数を求めなさい。

※ x軸は $y = 0$

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = -x^2$</p> <p>$-x^2 = 0$</p> <p>$x^2 = 0$</p> <p>$x = 0$</p> <p>共有点は1個</p> <p>1 common point</p>	<p>① $y = -4x^2$</p>
<p>② $y = x^2 + 5x + 6$</p> <p>$x^2 + 5x + 6 = 0$</p> <p>$(x + 2)(x + 3) = 0$</p> <p>$x = -2, -3$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>② $y = x^2 + 6x + 8$</p>
<p>③ $y = x^2 + 7x + 6$</p> <p>$x^2 + 7x + 6 = 0$</p> <p>$(x + 1)(x + 6) = 0$</p> <p>$x = -1, -6$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>③ $y = x^2 + 8x + 7$</p>
<p>④ $y = x^2 + 10x + 25$</p> <p>$x^2 + 10x + 25 = 0$</p> <p>$(x + 5)^2 = 0$</p> <p>$x = -5$</p> <p>共有点は1個</p> <p>1 common point</p>	<p>④ $y = x^2 - 6x + 9$</p>
<p>⑤ $y = x^2 + 6x$</p> <p>$x^2 + 6x = 0$</p> <p>$x(x + 6) = 0$</p> <p>$x = 0, -6$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>⑤ $y = x^2 + 2x$</p>
<p>⑥ $y = x^2 - 49$</p> <p>$x^2 - 49 = 0$</p> <p>$(x + 7)(x - 7) = 0$</p> <p>$x = -7, 7$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>⑥ $y = x^2 - 1$</p>

2. 判別式 D を用いて、2次関数のグラフとx軸との共有点の個数を求めなさい。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

$$\begin{cases} D > 0 \cdots 2 \text{ 個} \\ D = 0 \cdots 1 \text{ 個} \\ D < 0 \cdots 0 \text{ 個} \end{cases}$$

Find the number of common points between the graph of the following quadratic function and the x-axis using the discriminant D .

例題	問題
<p>① $y = x^2 + 6x + 5$</p> <p>$a = 1, b = 6, c = 5$</p> <p>$D = 6^2 - 4 \times 1 \times 5$</p> <p>$= 16 > 0$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>① $y = x^2 + 4x + 3$</p>
<p>② $y = x^2 - 6x + 9$</p> <p>$a = 1, b = -6, c = 9$</p> <p>$D = (-6)^2 - 4 \times 1 \times 9$</p> <p>$= 0$</p> <p>共有点は1個</p> <p>1 common point</p>	<p>② $y = x^2 - 4x + 4$</p>
<p>③ $y = x^2 + 2x + 3$</p> <p>$a = 1, b = 2, c = 3$</p> <p>$D = 2^2 - 4 \times 1 \times 3$</p> <p>$= -8 < 0$</p> <p>共有点は0個</p> <p>zero common point</p>	<p>③ $y = x^2 + 4x + 6$</p>
<p>④ $y = 2x^2 + 3x + 1$</p> <p>$a = 2, b = 3, c = 1$</p> <p>$D = 3^2 - 4 \times 2 \times 1$</p> <p>$= 1 > 0$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>④ $y = 3x^2 + 4x + 1$</p>
<p>⑤ $y = x^2 - 1$</p> <p>$a = 1, b = 0, c = -1$</p> <p>$D = 0^2 - 4 \times 1 \times (-1)$</p> <p>$= 4 > 0$</p> <p>共有点は2個</p> <p>2 common points</p>	<p>⑤ $y = x^2 - 9$</p>
<p>⑥ $y = 2x^2 - 4x + 2$</p> <p>$a = 2, b = -4, c = 2$</p> <p>$D = (-4)^2 - 4 \times 2 \times 2$</p> <p>$= 0$</p> <p>共有点は1個</p> <p>1 common point</p>	<p>⑥ $y = 2x^2 - 8x + 8$</p>
<p>⑦ $y = 2x^2 - 4x + 3$</p> <p>$a = 2, b = -4, c = 3$</p> <p>$D = (-4)^2 - 4 \times 2 \times 3$</p> <p>$= -8 < 0$</p> <p>共有点は0個</p> <p>zero common point</p>	<p>⑦ $y = 2x^2 - 5x + 3$</p>

数学Ⅰ 2次関数のグラフと2次方程式(個数) 3 課題

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1. 数を代入し、次の1次方程式の解を求めよ。
Substitute the numbers and solve the following linear equation.

例題 「 $x + 3 = 0$ 」	問題 「 $x + 1 = 0$ 」
① $x = 0$ のとき $x + 3 = 0 + 3 = 3$	① $x = 0$ のとき
② $x = 3$ のとき $x + 3 = 3 + 3 = 6$	② $x = 1$ のとき
③ $x = -3$ のとき $x + 3 = -3 + 3 = 0$	③ $x = -1$ のとき
④ $x + 3 = 0$ の解は <u>$x = -3$</u>	④ $x + 1 = 0$ の解は

2. 数を代入し、次の2次方程式の解を求めよ。
Substitute the numbers and solve the following linear equation.

例題 「 $(x + 3)(x + 2) = 0$ 」	問題 「 $(x + 1)(x - 2) = 0$ 」
① $x = 0$ のとき $(0 + 3)(0 + 2) = 6$	① $x = 0$ のとき
② $x = 3$ のとき $(3 + 3)(3 + 2) = 30$	② $x = 1$ のとき
③ $x = -3$ のとき $(-3 + 3)(-3 + 2) = 0$	③ $x = -1$ のとき
④ $x = 2$ のとき $(2 + 3)(2 + 2) = 20$	④ $x = 2$ のとき
⑤ $x = -2$ のとき $(-2 + 3)(-2 + 2) = 0$	⑤ $x = -2$ のとき
⑥ $(x + 3)(x + 2) = 0$ の解は <u>$x = -3, -2$</u>	⑥ $(x + 1)(x - 2) = 0$ の解は

3. 次の式を展開しなさい。
Expand the following expression.

例題	問題
① $x(x + 3)$ $= x \times x + x \times 3$ $= x^2 + 3x$	① $x(x + 1)$
② $(x + 3)(x + 2)$ $= x^2 + (3 + 2)x + 3 \times 2$ $= x^2 + 5x + 6$	② $(x + 1)(x + 2)$
③ $(x - 3)(x - 4)$ $= x^2 + (-3 - 4)x + (-3) \times (-4)$ $= x^2 - 7x + 12$	③ $(x - 1)(x - 2)$
④ $(x - 3)(x + 5)$ $= x^2 + (-3 + 5)x + (-3) \times 5$ $= x^2 + 2x - 15$	④ $(x - 1)(x + 4)$
⑤ $(x - 5)(x + 5)$ $= x^2 + (-5 + 5)x + (-5) \times 5$ $= x^2 - 25$	⑤ $(x - 4)(x + 4)$

4. 次の2次関数のグラフとx軸との共有点の個数を求めなさい。
※ x 軸は $y = 0$

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = -x^2$ $-x^2 = 0$ 共有点は 1 個 1 common point	① $y = -3x^2$
② $y = (x + 3)^2$ $(x + 3)^2 = 0$ 共有点は 1 個 1 common point	② $y = (x + 1)^2$
③ $y = (x + 3)(x + 2)$ $(x + 3)(x + 2) = 0$ 共有点は 2 個 2 common points	③ $y = (x + 1)(x - 2)$
④ $y = x(x - 3)$ $x(x - 3) = 0$ 共有点は 2 個 2 common points	④ $y = x(x - 1)$
⑤ $y = (x - 1)^2 + 3$ $(x - 1)^2 + 3 = 0$ 共有点は 0 個 zero common point	⑤ $y = (x + 2)^2 + 1$
⑥ $y = x^2 + 3x$ $x^2 + 3x = 0$ $x(x + 3) = 0$ 共有点は 2 個 2 common points	⑥ $y = x^2 + x$
⑦ $y = x^2 - 7x + 12$ $x^2 - 7x + 12 = 0$ $(x - 3)(x - 4) = 0$ 共有点は 2 個 2 common points	⑦ $y = x^2 - 3x + 2$
⑧ $y = x^2 - 25$ $x^2 - 25 = 0$ $(x - 5)(x + 5) = 0$ 共有点は 2 個 2 common points	⑧ $y = x^2 - 16$
⑨ $y = x^2 - 2x + 4$ $x^2 - 2x + 4 = 0$ $(x - 1)^2 + 3 = 0$ 共有点は 0 個 zero common point ※ $D = (-2)^2 - 4 \times 1 \times 4 < 0$	⑨ $y = x^2 + 4x + 6$

1. 次の2次関数のグラフとx軸との共有点の個数を求めなさい。

※ x軸は $y = 0$

Find the number of common points between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = -2x^2$</p> <p>$-2x^2 = 0$</p> <p>$x^2 = 0$</p> <p>$x = 0$</p> <p>共有点は1個 1 common point</p>	<p>① $y = -3x^2$</p>
<p>② $y = x^2 + 6x + 5$</p> <p>$x^2 + 6x + 5 = 0$</p> <p>$(x + 1)(x + 5) = 0$</p> <p>$x = -1, -5$</p> <p>共有点は2個 2 common points</p>	<p>② $y = x^2 + 7x + 10$</p>
<p>③ $y = x^2 - 5x + 6$</p> <p>$x^2 - 5x + 6 = 0$</p> <p>$(x - 2)(x - 3) = 0$</p> <p>$x = 2, 3$</p> <p>共有点は2個 2 common points</p>	<p>③ $y = x^2 - 3x + 2$</p>
<p>④ $y = x^2 - 12x + 36$</p> <p>$x^2 - 12x + 36 = 0$</p> <p>$(x - 6)^2 = 0$</p> <p>$x = 6$</p> <p>共有点は1個 1 common point</p>	<p>④ $y = x^2 - 6x + 9$</p>
<p>⑤ $y = x^2 - 2x$</p> <p>$x^2 - 2x = 0$</p> <p>$x(x - 2) = 0$</p> <p>$x = 0, 2$</p> <p>共有点は2個 2 common points</p>	<p>⑤ $y = x^2 - 6x$</p>
<p>⑥ $y = x^2 - 49$</p> <p>$x^2 - 49 = 0$</p> <p>$(x + 7)(x - 7) = 0$</p> <p>$x = -7, 7$</p> <p>共有点は2個 2 common points</p>	<p>⑥ $y = x^2 - 4$</p>

2. 判別式Dを用いて、2次関数のグラフとx軸との共有点の個数を求めなさい。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

$$\begin{cases} D > 0 \cdots 2 \text{ 個} \\ D = 0 \cdots 1 \text{ 個} \\ D < 0 \cdots 0 \text{ 個} \end{cases}$$

Find the number of common points between the graph of the following quadratic function and the x-axis using the discriminant D.

例題	問題
<p>① $y = x^2 - 6x + 5$ $a = 1, b = -6, c = 5$</p> <p>$D = (-6)^2 - 4 \times 1 \times 5$</p> <p>$= 16 > 0$</p> <p>共有点は2個 2 common points</p>	<p>① $y = x^2 - 5x + 4$</p>
<p>② $y = x^2 - 2x + 1$ $a = 1, b = -2, c = 1$</p> <p>$D = (-2)^2 - 4 \times 1 \times 1$</p> <p>$= 0$</p> <p>共有点は1個 1 common point</p>	<p>② $y = x^2 - 8x + 16$</p>
<p>③ $y = x^2 - 2x + 3$ $a = 1, b = -2, c = 3$</p> <p>$D = (-2)^2 - 4 \times 1 \times 3$</p> <p>$= -8 < 0$</p> <p>共有点は0個 zero common point</p>	<p>③ $y = x^2 - 4x + 5$</p>
<p>④ $y = 5x^2 + 6x + 1$ $a = 5, b = 6, c = 1$</p> <p>$D = 6^2 - 4 \times 5 \times 1$</p> <p>$= 16 > 0$</p> <p>共有点は2個 2 common points</p>	<p>④ $y = 4x^2 + 5x + 1$</p>
<p>⑤ $y = 9x^2 - 1$ $a = 9, b = 0, c = -1$</p> <p>$D = 0^2 - 4 \times 9 \times (-1)$</p> <p>$= 36 > 0$</p> <p>共有点は2個 2 common points</p>	<p>⑤ $y = 4x^2 - 1$</p>
<p>⑥ $y = 3x^2 - 4x + 2$ $a = 3, b = -4, c = 2$</p> <p>$D = (-4)^2 - 4 \times 3 \times 2$</p> <p>$= -8 < 0$</p> <p>共有点は0個 zero common point</p>	<p>⑥ $y = 3x^2 - 2x + 1$</p>
<p>⑦ $y = -x^2 + 2x - 1$ $a = -1, b = 2, c = -1$</p> <p>$D = 2^2 - 4 \times (-1) \times (-1)$</p> <p>$= 0$</p> <p>共有点は1個 1 common point</p>	<p>⑦ $y = -x^2 - 4x - 4$</p>

1. 次の一次方程式を解きなさい。※ $x = \cdots$ の形で書く。
Solve the following linear equations. ※Write in the form of “ $x = \dots$ ”

例題	問題
① $x - 2 = 0$ $x = 2$	① $x - 3 = 0$
② $x + 3 = 0$ $x = -3$	② $x + 3 = 0$
③ $2x = 0$ $x = 0$	③ $3x = 0$

2. 次の2次方程式を解きなさい。
Solve the quadratic equation.

例題	問題
① $3x^2 = 0$ $x^2 = 0$ <u>$x = 0$ (重解)</u>	① $4x^2 = 0$
② $(x + 2)^2 = 0$ <u>$x = -2$ (重解)</u>	② $(x + 1)^2 = 0$
③ $(x + 1)(x - 3) = 0$ <u>$x = -1, 3$</u>	③ $(x + 2)(x - 5) = 0$
④ $x(x + 5) = 0$ <u>$x = 0, -5$</u>	④ $x(x + 4) = 0$
⑤ $(x - 2)^2 + 2 = 0$ $(x - 2)^2 \geq 0$ より <u>解なし</u>	⑤ $(x - 3)^2 + 1 = 0$

3. 次の式を展開しなさい。
Expand the following expression.

例題	問題
① $x(x + 2)$ $= x \times x + x \times 2$ $= x^2 + 2x$	① $x(x + 5)$
② $(x + 3)(x + 1)$ $= x^2 + (3+1)x + 3 \times 1$ $= x^2 + 4x + 3$	② $(x + 5)(x + 1)$
③ $(x + 1)(x - 4)$ $= x^2 + (1-4)x + 1 \times (-4)$ $= x^2 - 3x - 4$	③ $(x + 1)(x - 6)$
④ $(x - 2)(x - 4)$ $= x^2 + (-2-4)x + (-2) \times (-4)$ $= x^2 - 6x + 8$	④ $(x - 2)(x - 5)$
⑤ $(x - 2)(x + 2)$ $= x^2 + (-2+2)x + (-2) \times 2$ $= x^2 - 4$	⑤ $(x - 1)(x + 1)$

4. 次の2次関数のグラフとx軸との位置関係をもめなさい。
※x軸は $y = 0$

Find the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
① $y = 3x^2$ $3x^2 = 0$ 1点で接する touch at 1 point	① $y = 4x^2$
② $y = (x + 2)^2$ $(x + 2)^2 = 0$ 1点で接する touch at 1 point	② $y = (x + 1)^2$
③ $y = (x + 1)(x - 3)$ $(x + 1)(x - 3) = 0$ 2点で交わる intersect at 2 different points	③ $y = (x + 2)(x - 5)$
④ $y = x(x + 5)$ $x(x + 5) = 0$ 2点で交わる intersect at 2 different points	④ $y = x(x + 4)$
⑤ $y = (x - 2)^2 + 2$ $(x - 2)^2 + 2 = 0$ 共有点をもたない no common point	⑤ $y = (x - 3)^2 + 2$
⑥ $y = x^2 + 2x$ $x^2 + 2x = 0$ $x(x + 2) = 0$ 2点で交わる intersect at 2 different points	⑥ $y = x^2 + 5x$
⑦ $y = x^2 + 4x + 3$ $x^2 + 4x + 3 = 0$ $(x + 3)(x + 1) = 0$ 2点で交わる intersect at 2 different points	⑦ $y = x^2 + 6x + 5$
⑧ $y = x^2 - 4$ $x^2 - 4 = 0$ $(x - 2)(x + 2) = 0$ 2点で交わる intersect at 2 different points	⑧ $y = x^2 - 9$
⑨ $y = x^2 - 4x + 6$ $x^2 - 4x + 6 = 0$ $(x - 2)^2 + 2 = 0$ 共有点をもたない no common point ※ $D = (-4)^2 - 4 \times 1 \times 6 < 0$	⑨ $y = x^2 - 6x + 10$

1. 次の2次関数のグラフとx軸との位置関係を求めなさい。

※ x軸は $y = 0$

Find the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = 2x^2$</p> <p>$2x^2 = 0$</p> <p>$x^2 = 0$</p> <p>$x = 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>① $y = -2x^2$</p>
<p>② $y = x^2 + 4x + 3$</p> <p>$x^2 + 4x + 3 = 0$ 1+3 1×3</p> <p>$(x + 1)(x + 3) = 0$</p> <p>$x = -1, -3$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>② $y = x^2 + 6x + 5$</p>
<p>③ $y = x^2 - 2x - 3$</p> <p>$x^2 - 2x - 3 = 0$ 1+(-3) 1×(-3)</p> <p>$(x + 1)(x - 3) = 0$</p> <p>$x = -1, 3$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>③ $y = x^2 - 4x - 5$</p>
<p>④ $y = x^2 + 6x + 9$</p> <p>$x^2 + 6x + 9 = 0$ 3+3 3×3</p> <p>$(x + 3)^2 = 0$</p> <p>$x = -3$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>④ $y = x^2 + 8x + 16$</p>
<p>⑤ $y = x^2 - 4x$</p> <p><u>x^2</u> - 4 <u>x</u> = 0</p> <p>$x(x - 4) = 0$</p> <p>$x = 0, 4$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = x^2 - 5x$</p>
<p>⑥ $y = x^2 - 64$</p> <p>$x^2 - 64 = 0$</p> <p>$(x + 8)(x - 8) = 0$</p> <p>$x = -8, 8$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑥ $y = x^2 - 49$</p>

2. 判別式 D を用いて、2次関数のグラフとx軸との位置関係を求めなさい。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

$\left\{ \begin{array}{l} D > 0 \cdots 2 \text{点で交わる} \\ D = 0 \cdots 1 \text{点で接する} \\ D < 0 \cdots \text{共有点なし} \end{array} \right.$

Find the positional relationship between the graph of the following quadratic function and the x-axis using the discriminant D .

例題	問題
<p>① $y = x^2 + 4x + 3$ $a = 1, b = 4, c = 3$</p> <p>$D = 4^2 - 4 \times 1 \times 3$</p> <p>$= 4 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>① $y = x^2 + 5x + 4$</p>
<p>② $y = x^2 - 2x + 1$ $a = 1, b = -2, c = 1$</p> <p>$D = (-2)^2 - 4 \times 1 \times 1$</p> <p>$= 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>② $y = x^2 - 6x + 9$</p>
<p>③ $y = x^2 + 4x + 5$ $a = 1, b = 4, c = 5$</p> <p>$D = 4^2 - 4 \times 1 \times 5$</p> <p>$= -4 < 0$</p> <p><u>共有点をもたない</u> no common point</p>	<p>③ $y = x^2 + 2x + 3$</p>
<p>④ $y = 3x^2 + 4x + 1$ $a = 3, b = 4, c = 1$</p> <p>$D = 4^2 - 4 \times 3 \times 1$</p> <p>$= 4 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>④ $y = 4x^2 + 5x + 1$</p>
<p>⑤ $y = x^2 - 4$ $a = 1, b = 0, c = -4$</p> <p>$D = 0^2 - 4 \times 1 \times (-4)$</p> <p>$= 16 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = x^2 - 1$</p>
<p>⑥ $y = 3x^2 - 6x + 3$ $a = 3, b = -6, c = 3$</p> <p>$D = (-6)^2 - 4 \times 3 \times 3$</p> <p>$= 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>⑥ $y = 2x^2 - 8x + 8$</p>
<p>⑦ $y = 3x^2 - 4x + 2$ $a = 3, b = -4, c = 2$</p> <p>$D = (-4)^2 - 4 \times 3 \times 2$</p> <p>$= -8 < 0$</p> <p><u>共有点をもたない</u> no common point</p>	<p>⑦ $y = 2x^2 - 4x + 3$</p>

1. 数を代入し、次の1次方程式の解を求めよ。
Substitute the numbers and solve the following linear equation.

4. 次の2次関数のグラフとx軸との位置関係を求めなさい。
※x軸はy = 0
Find the positional relationship between the graph of the following quadratic function and the x-axis.

<div>れいだい</div> <div>例題 「$x - 2 = 0$」</div>	<div>もんだい</div> <div>問題 「$x - 5 = 0$」</div>
① $x = 0$ のとき $x - 2 = 0 - 2 = -2$	① $x = 0$ のとき
② $x = 2$ のとき $x - 2 = 2 - 2 = 0$	② $x = 5$ のとき
③ $x = -2$ のとき $x - 2 = -2 - 2 = -4$	③ $x = -5$ のとき
④ $x - 2 = 0$ の解は <u>$x = 2$</u>	④ $x - 5 = 0$ の解は

<div>れいだい</div> <div>例題 「$x(x - 2) = 0$」</div>	<div>もんだい</div> <div>問題 「$x(x - 5) = 0$」</div>
① $x = 0$ のとき $0(0 - 2) = 0$	① $x = 0$ のとき
② $x = 2$ のとき $2(2 - 2) = 0$	② $x = 5$ のとき
③ $x = -2$ のとき $-2(-2 - 2) = 8$	③ $x = -5$ のとき
⑥ $x(x - 2) = 0$ の解は <u>$x = 0, 2$</u>	⑥ $x(x - 5) = 0$ の解は

<div>れいだい</div> <div>例題</div>	<div>もんだい</div> <div>問題</div>
① $x(x - 2)$ $= x \times x + x \times (-2)$ $= x^2 - 2x$	① $x(x - 5)$
② $(x - 2)(x + 4)$ $= x^2 + (-2 + 4)x + (-2) \times 4$ $= x^2 + 2x - 8$	② $(x - 5)(x + 7)$
③ $(x - 2)(x - 6)$ $= x^2 + (-2 - 6)x + (-2) \times (-6)$ $= x^2 - 8x + 12$	③ $(x - 5)(x - 3)$
④ $(x - 2)(x + 6)$ $= x^2 + (-2 + 6)x + (-2) \times 6$ $= x^2 + 4x - 12$	④ $(x - 1)(x + 5)$
⑤ $(x - 2)(x - 2)$ $= x^2 + (-2 - 2)x + (-2) \times (-2)$ $= x^2 - 4x + 4$	⑤ $(x + 5)(x + 5)$
⑥ $(x - 2)(x + 2)$ $= x^2 + (-2 + 2)x + (-2) \times 2$ $= x^2 - 4$	⑥ $(x - 5)(x + 5)$

<div>れいだい</div> <div>例題</div>	<div>もんだい</div> <div>問題</div>
① $y = -3x^2$ $-3x^2 = 0$ <u>1点で接する</u> touch at 1 point	① $y = -4x^2$
② $y = (x - 2)^2$ $(x - 2)^2 = 0$ <u>1点で接する</u> touch at 1 point	② $y = (x - 5)^2$
③ $y = x(x - 2)$ $x(x - 2) = 0$ <u>2点で交わる</u> intersect at 2 different points	③ $y = x(x - 5)$
④ $y = (x - 2)(x - 3)$ $(x - 2)(x - 3) = 0$ <u>2点で交わる</u> intersect at 2 different points	④ $y = (x - 1)(x - 5)$
⑤ $y = (x - 2)^2 + 3$ $(x - 2)^2 + 3 = 0$ <u>共有点をもたない</u> no common point	⑤ $y = (x - 5)^2 + 5$
⑥ $y = x^2 - 4x$ $x^2 - 4x = 0$ $x(x - 4) = 0$ <u>2点で交わる</u> intersect at 2 different points	⑥ $y = x^2 - 6x$
⑦ $y = x^2 + 2x - 8$ $x^2 + 2x - 8 = 0$ $(x - 2)(x + 4) = 0$ <u>2点で交わる</u> intersect at 2 different points	⑦ $y = x^2 + 2x - 35$
⑧ $y = x^2 - 4x + 4$ $x^2 - 4x + 4 = 0$ $(x - 2)^2 = 0$ <u>1点で接する</u> touch at 1 point	⑧ $y = x^2 - 10x + 25$
⑨ $y = x^2 - 6x + 10$ $x^2 - 6x + 10 = 0$ $(x - 3)^2 + 1 = 0$ <u>共有点をもたない</u> no common point	⑨ $y = x^2 - 4x + 5$

1. 次の2次関数のグラフとx軸との位置関係を求めなさい。

※ x軸は $y = 0$

Find the positional relationship between the graph of the following quadratic function and the x-axis.

例題	問題
<p>① $y = 2x^2$</p> <p>$2x^2 = 0$</p> <p>$x^2 = 0$</p> <p>$x = 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>① $y = -2x^2$</p>
<p>② $y = x^2 + 5x + 6$</p> <p>$x^2 + 5x + 6 = 0$ $2+3 \quad 2 \times 3$</p> <p>$(x + 2)(x + 3) = 0$</p> <p>$x = -2, -3$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>② $y = x^2 + 5x + 4$</p>
<p>③ $y = x^2 - 4x + 3$</p> <p>$x^2 - 4x + 3 = 0$ $(-1)+(-3) \quad (-1) \times (-3)$</p> <p>$(x - 1)(x - 3) = 0$</p> <p>$x = 1, 3$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>③ $y = x^2 - 7x + 6$</p>
<p>④ $y = x^2 - 2x + 1$</p> <p>$x^2 - 2x + 1 = 0$ $(-1)+(-1) \quad (-1) \times (-1)$</p> <p>$(x - 1)^2 = 0$</p> <p>$x = 1$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>④ $y = x^2 - 4x + 4$</p>
<p>⑤ $y = x^2 + x$</p> <p><u>$x^2 + x = 0$</u></p> <p>$x(x + 1) = 0$</p> <p>$x = 0, -1$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = x^2 - x$</p>
<p>⑥ $y = x^2 - 64$</p> <p>$x^2 - 64 = 0$</p> <p>$(x + 8)(x - 8) = 0$</p> <p>$x = -8, 8$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑥ $y = x^2 - 81$</p>

2. 判別式 D を用いて、2次関数のグラフとx軸との位置関係を求めなさい。

※ $ax^2 + bx + c$ のとき $D = b^2 - 4ac$

$\begin{cases} D > 0 \cdots 2 \text{点で交わる} \\ D = 0 \cdots 1 \text{点で接する} \\ D < 0 \cdots \text{共有点なし} \end{cases}$

Find the positional relationship between the graph of the following quadratic function and the x-axis using the discriminant D .

例題	問題
<p>① $y = x^2 + 7x + 6$ $a = 1, b = 7, c = 6$</p> <p>$D = 7^2 - 4 \times 1 \times 6$</p> <p>$= 25 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>① $y = x^2 + 5x + 6$</p>
<p>② $y = x^2 - 6x + 9$ $a = 1, b = -6, c = 9$</p> <p>$D = (-6)^2 - 4 \times 1 \times 9$</p> <p>$= 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>② $y = x^2 - 2x + 1$</p>
<p>③ $y = x^2 - 4x + 6$ $a = 1, b = -4, c = 6$</p> <p>$D = (-4)^2 - 4 \times 1 \times 6$</p> <p>$= -8 < 0$</p> <p><u>共有点をもたない</u> no common point</p>	<p>③ $y = x^2 - 2x + 4$</p>
<p>④ $y = 5x^2 + 6x + 1$ $a = 5, b = 6, c = 1$</p> <p>$D = 6^2 - 4 \times 5 \times 1$</p> <p>$= 16 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>④ $y = 6x^2 + 5x + 1$</p>
<p>⑤ $y = 2x^2 - 8$ $a = 2, b = 0, c = -8$</p> <p>$D = 0^2 - 4 \times 2 \times (-8)$</p> <p>$= 64 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑤ $y = 4x^2 - 4$</p>
<p>⑥ $y = -x^2 + 4x - 4$ $a = -1, b = 4, c = -4$</p> <p>$D = 4^2 - 4 \times (-1) \times (-4)$</p> <p>$= 0$</p> <p><u>1点で接する</u> touch at 1 point</p>	<p>⑥ $y = -x^2 - 2x - 1$</p>
<p>⑦ $y = 3x^2 - 5x + 2$ $a = 3, b = -5, c = 2$</p> <p>$D = (-5)^2 - 4 \times 3 \times 2$</p> <p>$= 1 > 0$</p> <p><u>2点で交わる</u> intersect at 2 different points</p>	<p>⑦ $y = 2x^2 - 5x + 2$</p>

