Quadratic Equations Practice

Name: _____ Date: _____

Question 1

Solve

I. $x^2 = 144$

II. $5x^2 = 30$

III. $36x^2 - 25 = 0$

IV. $(x + 5)^2 = 12$

V. $x^2 - 10x + 25 = 64$

Question 2

Solve

I. $x^2 - 10x + 23 = 0$

Quadratic Equations Practice

II. $x^2 + 8x - 3 = 0$

III. $4x^2 + 8x + 3 = 0$

Question 3

Find the x-intercepts

I. $f(x) = 4x^2 + 2x - 3$

Quadratic Equations Practice

Question 4

Solve using the quadratic formula

I. $x^2 + 2x - 4 = 0$

II. $3x(x + 2) = 1$

III. $\frac{1}{x^2} - 3 = \frac{8}{x}$

Quadratic Equations Practice

IV. $14(x - 4) - (x + 2) = (x - 4)(x + 2)$

Question 5

Find the related quadratic equation

I. $-5, 4$

II. $\sqrt{3}, -\sqrt{3}$

III. $2\sqrt{5}, -2\sqrt{5}$

IV. $4i, -4i$

V. $2 - \sqrt{10}, 2 + \sqrt{10}$

Quadratic Equations Practice

Question 6

Solve

I. $x^4 - 13x^2 + 36 = 0$

II. $(x^2 + 6)^2 - 7(x^2 + 6) + 10 = 0$

Question 7

Solve

I. $x + 4\sqrt{x} - 12 = 0$

Quadratic Equations Practice

II. $(1+\sqrt{x})^2 + 5(1+\sqrt{x}) + 6 = 0$

III. $2x^{-2} + 7x^{-1} - 15 = 0$

IV. $x^{1/2} + 3x^{1/4} + 2 = 0$

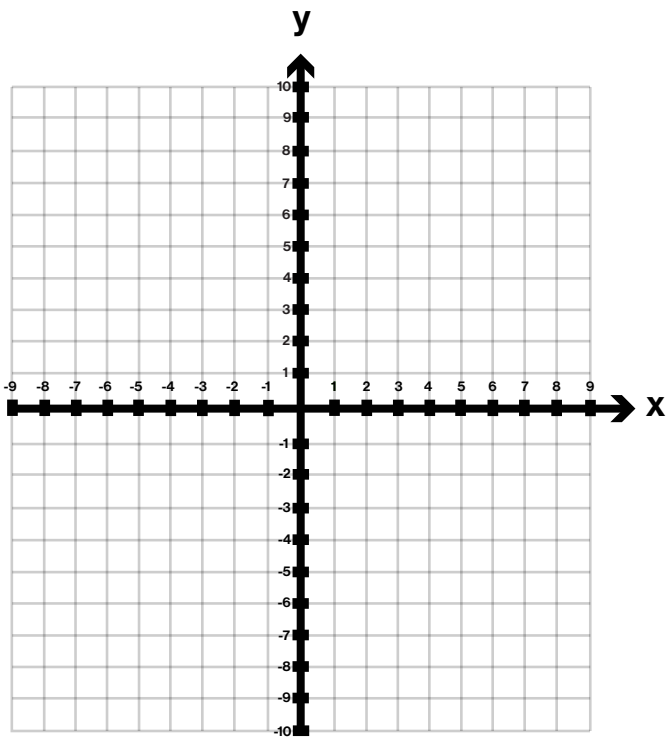
Quadratic Equations Practice

V. $9((x+2)/(x+3))^2 - 6((x+2)/(x+3)) + 1 = 0$

Question 8

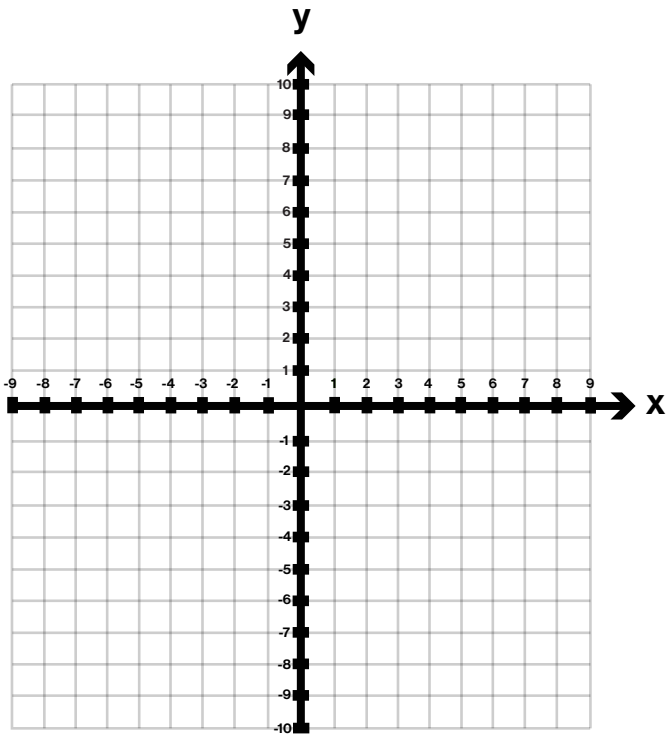
Graph

I. $f(x) = -3x^2$

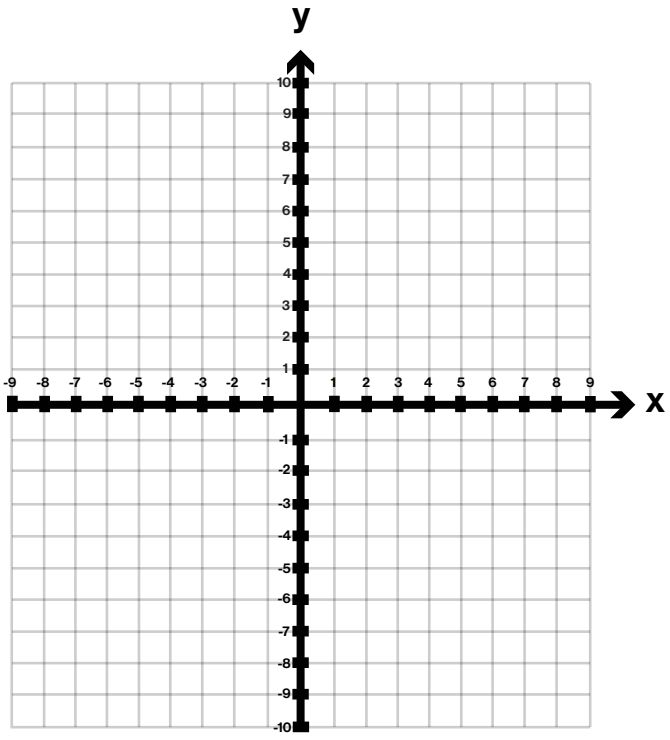


Quadratic Equations Practice

II. $f(x) = \frac{1}{8}x^2$

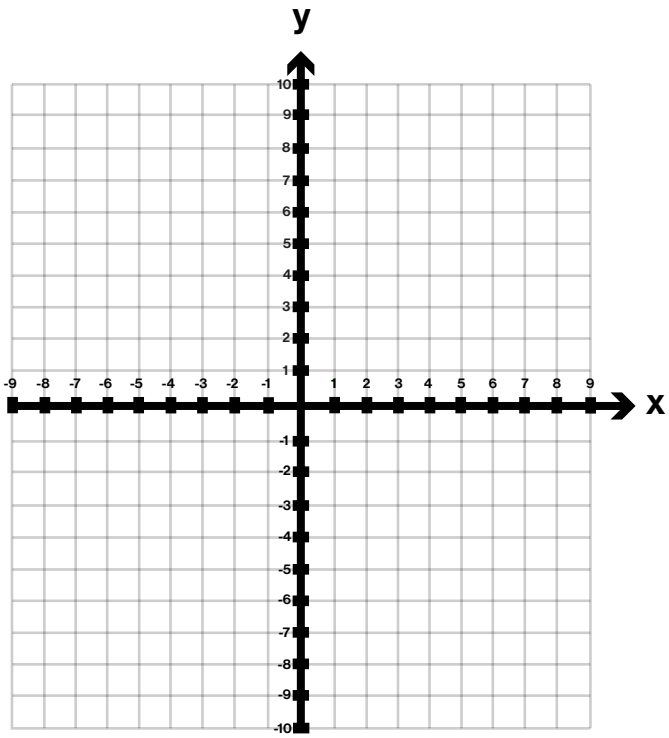


III. $f(x) = 2x^2 + 2$

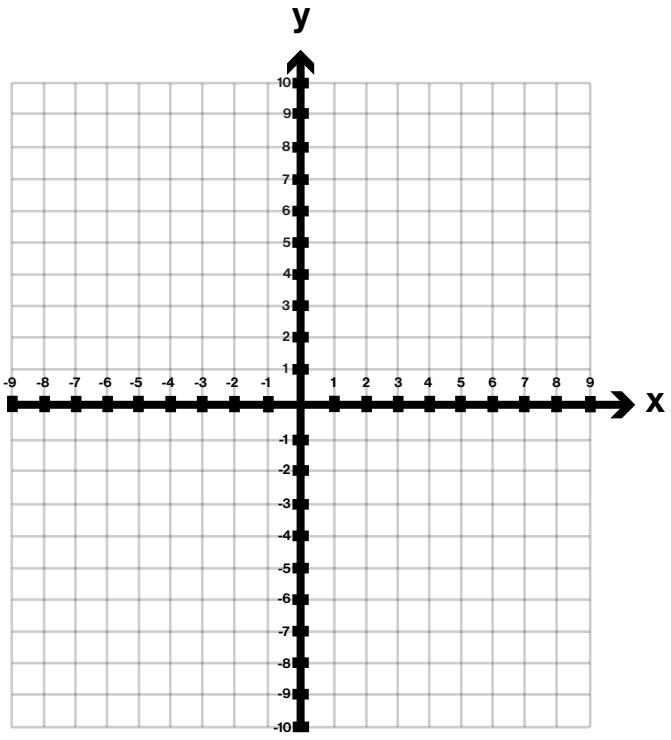


Quadratic Equations Practice

IV. $f(x) = 2(x + 2)^2$

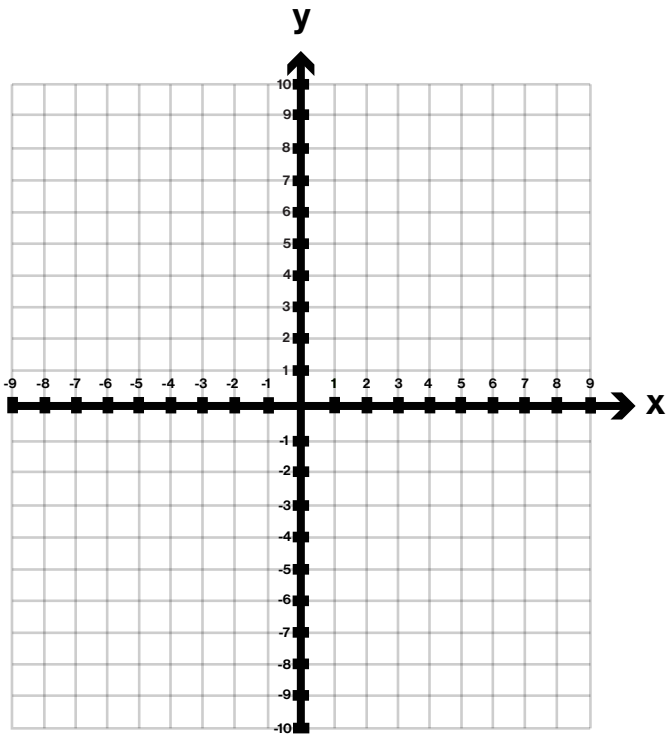


V. $f(x) = 2(x - 2)^2 - 2$

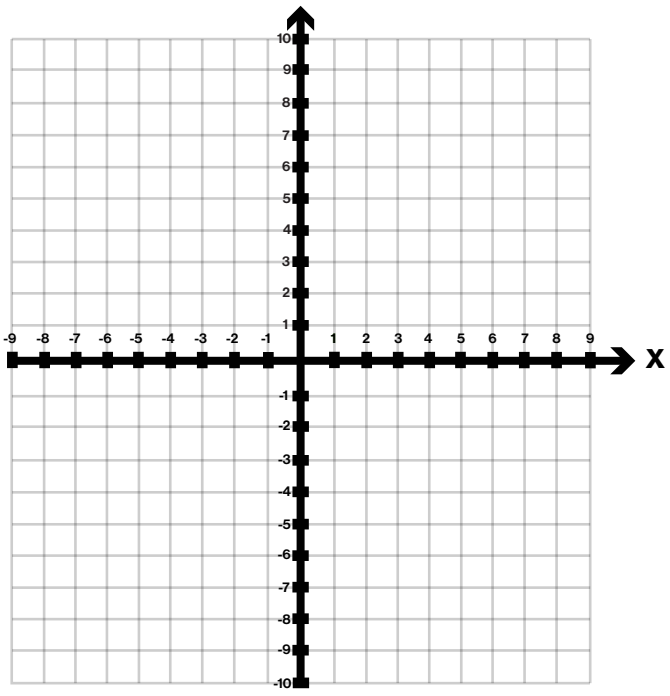


Quadratic Equations Practice

VI. $f(x) = x^2 + 2x + 2$



VII. $f(x) = 2x^2 - 4x - 2$



Quadratic Equations Practice

Name: **Key** Date: _____

Question 1

Solve

I. $x^2 = 144 \longrightarrow \sqrt{144}$ and $-\sqrt{144} \longrightarrow x = 12$ and -12

II. $5x^2 = 30 \longrightarrow x^2 = 6 \longrightarrow x = \sqrt{6}$ and $-\sqrt{6}$

III. $36x^2 - 25 = 0 \longrightarrow x^2 = 25/36 \longrightarrow \sqrt{25/36}$ and $-\sqrt{25/36} \longrightarrow x = 5/6$ and $-5/6$

IV. $(x+5)^2 = 12 \longrightarrow x + 5 = \sqrt{12}$ and $-\sqrt{12} \longrightarrow x + 5 = 2\sqrt{3}$ and $-2\sqrt{3}$

$\downarrow$

$x = 2\sqrt{3} - 5$ and $-2\sqrt{3} - 5$

V. $x^2 - 10x + 25 = 64 \longrightarrow (x-5)^2 = 64 \longrightarrow x - 5 = \sqrt{64}$ and $-\sqrt{64} \longrightarrow x - 5 = 8$ and -8

$\downarrow$

$x = 13$ and -3

Question 2

Solve

I. $x^2 - 10x + 23 = 0 \longrightarrow x^2 - 10x = -23 \longrightarrow (-10/2)^2 = 25 \longrightarrow x^2 - 10x + 25 = -23 + 25$

$\downarrow$

$x - 5 = \sqrt{2}$ and $-\sqrt{2} \longleftarrow (x-5)^2 = 2$

$\downarrow$

$x = \sqrt{2} + 5$ and $-\sqrt{2} + 5$

Quadratic Equations Practice

II. $x^2 + 8x - 3 = 0 \longrightarrow x^2 + 8x = 3 \longrightarrow (8/2)^2 = 16 \longrightarrow x^2 + 8x + 16 = 3 + 16$

$\downarrow$

$x + 4 = \sqrt{19}$ and $-\sqrt{19} \longleftarrow (x + 4)^2 = 19$

$\downarrow$

$x = \sqrt{19} - 4$ and $-\sqrt{19} - 4$

III. $4x^2 + 8x + 3 = 0 \longrightarrow 4x^2 + 8x = -3 \longrightarrow 4(x^2 + 2x) = -3 \longrightarrow x^2 + 2x = -3/4 \longrightarrow (2/2)^2 = 1$

$\downarrow$

$x + 1 = \sqrt{1/4}$ and $-\sqrt{1/4} \longleftarrow (x + 1)^2 = 1/4 \longleftarrow x^2 + 2x + 1 = -3/4 + 1$

$\downarrow$

$x + 1 = 1/2$ and $-1/2 \longrightarrow x = -1/2$ and $-3/2$

Question 3

Find the x-intercepts

I. $f(x) = 4x^2 + 2x - 3 \longrightarrow 0 = 4x^2 + 2x - 3 \longrightarrow 3 = 4x^2 + 2x \longrightarrow 3 = 4(x^2 + 1/2x)$

$\downarrow$

$3/4 + 1/16 = x^2 + 1/2x + 1/16 \longleftarrow ((1/2)/2)^2 = 1/16 \longleftarrow 3/4 = x^2 + 1/2x$

$\downarrow$

$13/16 = (x + 1/4)^2 \longrightarrow x + 1/4 = \sqrt{13/16}$ and $-\sqrt{13/16}$

$\downarrow$

$x + 1/4 = \dfrac{\sqrt{13}}{4}$ and $\dfrac{-\sqrt{13}}{4}$

$\downarrow$

$\longleftarrow x = \dfrac{\sqrt{13}}{4} - 1/4$ and $\dfrac{-\sqrt{13}}{4} - 1/4$

x-intercepts

$\left(\dfrac{-1 + \sqrt{13}}{4}, 0 \right)$

$\left(\dfrac{-1 - \sqrt{13}}{4}, 0 \right)$

Quadratic Equations Practice

Question 4

Solve using the quadratic formula

I. $x^2 + 2x - 4 = 0$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-4)}}{2(1)} \longrightarrow x = -1 + \sqrt{5} \quad \text{and} \quad -1 - \sqrt{5}$$

II. $3x(x + 2) = 1 \longrightarrow 3x^2 + 6x - 1 = 0$

$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(3)(-1)}}{2(3)} \longrightarrow x = \frac{-3 + 2\sqrt{3}}{3} \quad \text{and} \quad x = \frac{-3 - 2\sqrt{3}}{3}$$

OR

$$x = -\frac{3 + 2\sqrt{3}}{3}$$

III. $\frac{1}{x^2} - 3 = \frac{8}{x} \longrightarrow x^2\left(\frac{1}{x^2} - 3\right) = \left(\frac{8}{x}\right)x^2 \longrightarrow 1 - 3x^2 = 8x \longrightarrow 1 + -3x^2 + -8x = 0$

$$-3x^2 - 8x + 1 = 0 \longleftarrow -3x^2 + -8x + 1 = 0$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(-3)(1)}}{2(-3)} \longrightarrow x = -\frac{4 + \sqrt{19}}{3} \quad \text{and} \quad -\frac{4 - \sqrt{19}}{3}$$

OR OR

$$\frac{-4 - \sqrt{19}}{3} \qquad \frac{-4 + \sqrt{19}}{3}$$

Quadratic Equations Practice

IV. $14(x-4)-(x+2)=(x-4)(x+2) \longrightarrow 14x-56+-x-2=x^2-2x-8 \longrightarrow 14x-56-x-2=x^2-2x-8$

$$\downarrow$$

$$x^2-15x+50=0$$

$$x=\frac{-(-15)\pm\sqrt{(-15)^2-4(1)(50)}}{2(1)} \longrightarrow x=10 \text{ and } 5$$

Question 5

Find the related quadratic equation

I. $-5, 4 \longrightarrow \begin{matrix} x=-5 \\ x=4 \end{matrix} \longrightarrow \begin{matrix} x+5=0 \\ x-4=0 \end{matrix} \longrightarrow (x+5)(x-4)=0 \longrightarrow x^2+x-20=0$

II. $\sqrt{3}, -\sqrt{3} \longrightarrow \begin{matrix} x=\sqrt{3} \\ x=-\sqrt{3} \end{matrix} \longrightarrow \begin{matrix} x-\sqrt{3}=0 \\ x+\sqrt{3}=0 \end{matrix} \longrightarrow (x-\sqrt{3})(x+\sqrt{3})=0 \longrightarrow x^2-3=0$

III. $2\sqrt{5}, -2\sqrt{5} \longrightarrow \begin{matrix} x=2\sqrt{5} \\ x=-2\sqrt{5} \end{matrix} \longrightarrow \begin{matrix} x-2\sqrt{5}=0 \\ x+2\sqrt{5}=0 \end{matrix} \longrightarrow (x-2\sqrt{5})(x+2\sqrt{5})=0 \longrightarrow x^2-20=0$

IV. $4i, -4i \longrightarrow \begin{matrix} x=4i \\ x=-4i \end{matrix} \longrightarrow \begin{matrix} x-4i=0 \\ x+4i=0 \end{matrix} \longrightarrow (x-4i)(x+4i)=0 \longrightarrow x^2+16=0$

V. $2-\sqrt{10}, 2+\sqrt{10} \longrightarrow \begin{matrix} x=2-\sqrt{10} \\ x=2+\sqrt{10} \end{matrix} \longrightarrow \begin{matrix} x-2-\sqrt{10}=0 \\ x-2+\sqrt{10}=0 \end{matrix} \longrightarrow (x-2-\sqrt{10})(x-2+\sqrt{10})=0 \longrightarrow x^2-4x-6=0$

Quadratic Equations Practice

Question 6

Solve

I. $x^4 - 13x^2 + 36 = 0$ $\qquad a^2 = (x^2)^2 = x^4$

$\downarrow$ $\qquad a = x^2$

$a^2 - 13a + 36 = 0$

$$a = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(1)(36)}}{2(1)} \longrightarrow a = 9 \text{ and } 4$$

$9 = x^2 \longrightarrow x = \pm\sqrt{9}$ and $-\sqrt{9} \longrightarrow x = \overset{\text{True}}{3}$ and $\overset{\text{True}}{-3}$

$4 = x^2 \longrightarrow x = \pm\sqrt{4}$ and $-\sqrt{4} \longrightarrow x = \overset{\text{True}}{2}$ and $\overset{\text{True}}{-2}$

II. $(x^2 + 6)^2 - 7(x^2 + 6) + 10 = 0$ $\qquad a^2 = (x^2 + 6)^2$

$\downarrow$ $\qquad a = x^2 + 6$

$a^2 - 7a + 10 = 0$

$$a = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(10)}}{2(1)} \longrightarrow a = 5 \text{ and } 2$$

$5 = x^2 + 6 \longrightarrow -1 = x^2 \longrightarrow x = \pm\sqrt{-1}$ and $-\sqrt{-1} \longrightarrow x = \overset{\text{True}}{i}$ and $\overset{\text{True}}{-i}$

$2 = x^2 + 6 \longrightarrow -4 = x^2$ Lore $x = \pm\sqrt{-4}$ and $-\sqrt{-4} \longrightarrow x = \overset{\text{True}}{2i}$ and $\overset{\text{True}}{-2i}$

Question 7

Solve

I. $x + 4\sqrt{x} - 12 = 0$ $\qquad a^2 = x$

$\downarrow$ $\qquad a = \sqrt{x}$

$a^2 + 4a - 12 = 0$

$$a = \frac{-(4) \pm \sqrt{(4)^2 - 4(1)(-12)}}{2(1)} \longrightarrow a = 2 \text{ and } -6$$

$2 = \sqrt{x} \longrightarrow \overset{\text{True}}{4 = x}$

$-6 = \sqrt{x} \longrightarrow$ principal square roots cannot be negative

Quadratic Equations Practice

II. $(1+\sqrt{x})^2 + 5(1+\sqrt{x}) + 6 = 0$

$a^2 = (1+\sqrt{x})^2$

$a = 1+\sqrt{x}$

$\downarrow$

$a^2 + 5a + 6 = 0$

$$a = \frac{-(5) \pm \sqrt{(5)^2 - 4(1)(6)}}{2(1)} \longrightarrow a = -2 \text{ and } -3$$

$-2 = 1+\sqrt{x} \longrightarrow -3 = \sqrt{x}$

$\longrightarrow$ principal square roots cannot be negative $\longrightarrow$ no solution

$-3 = 1+\sqrt{x} \longrightarrow -4 = \sqrt{x}$

III. $2x^{-2} + 7x^{-1} - 15 = 0$

$a^2 = x^{-2}$

$a = x^{-1}$

$\downarrow$

$2a^2 + 7a - 15 = 0$

$$a = \frac{-(7) \pm \sqrt{(7)^2 - 4(2)(-15)}}{2(2)} \longrightarrow a = 3/2 \text{ and } -5$$

$3/2 = x^{-1} \longrightarrow 2/3 = x$ (True)

$-5 = x^{-1} \longrightarrow -1/5 = x$ (True)

IV. $x^{1/2} + 3x^{1/4} + 2 = 0$

$a^2 = x^{1/2}$

$a = x^{1/4}$

$\downarrow$

$a^2 + 3a + 2 = 0$

$$a = \frac{-(3) \pm \sqrt{(3)^2 - 4(1)(2)}}{2(1)} \longrightarrow a = -1 \text{ and } -2$$

$-1 = x^{1/4}$

$\longrightarrow$ principal fourth roots cannot be negative $\longrightarrow$ no solution

$-2 = x^{1/4}$

Quadratic Equations Practice

V. $9((x+2)/(x+3))^2 - 6((x+2)/(x+3)) + 1 = 0$ $\quad a^2 = ((x+2)/(x+3))^2$

$a = (x+2)/(x+3)$

↓

$9a^2 - 6a + 1 = 0$

$$a = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(9)(1)}}{2(9)} \longrightarrow a = 1/3$$

True

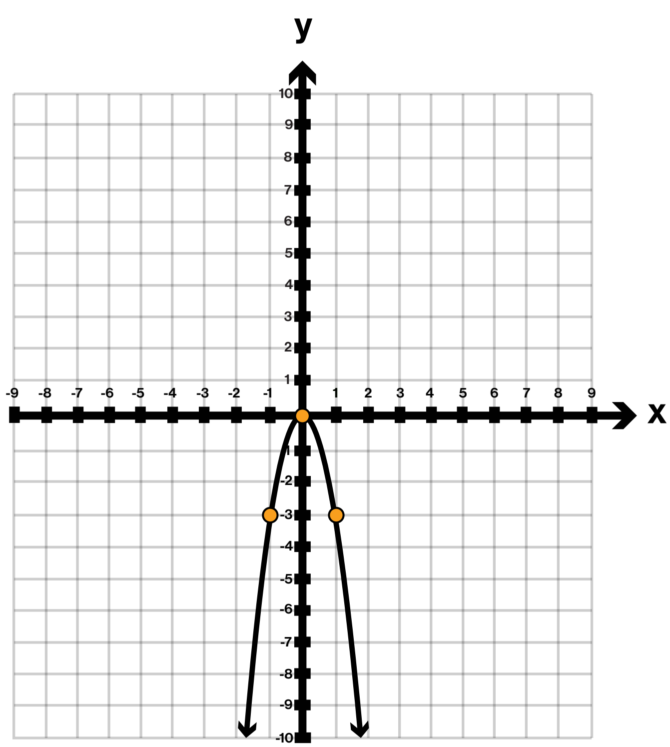
$1/3 = (x+2)/(x+3) \longrightarrow 3x + 6 = x + 3 \longrightarrow x = -3/2$

cross multiply

Question 8

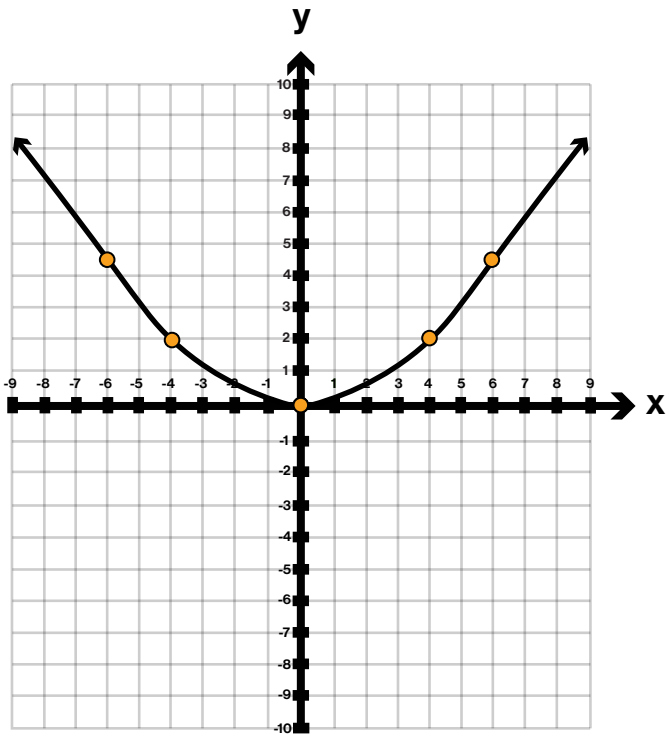
Graph

I. $f(x) = -3x^2$

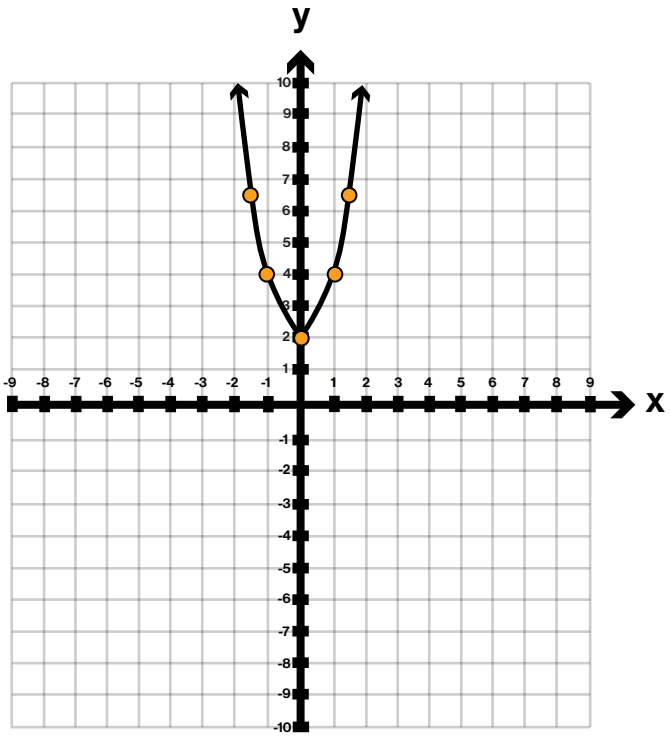


Quadratic Equations Practice

II. $f(x) = \frac{1}{8}x^2$

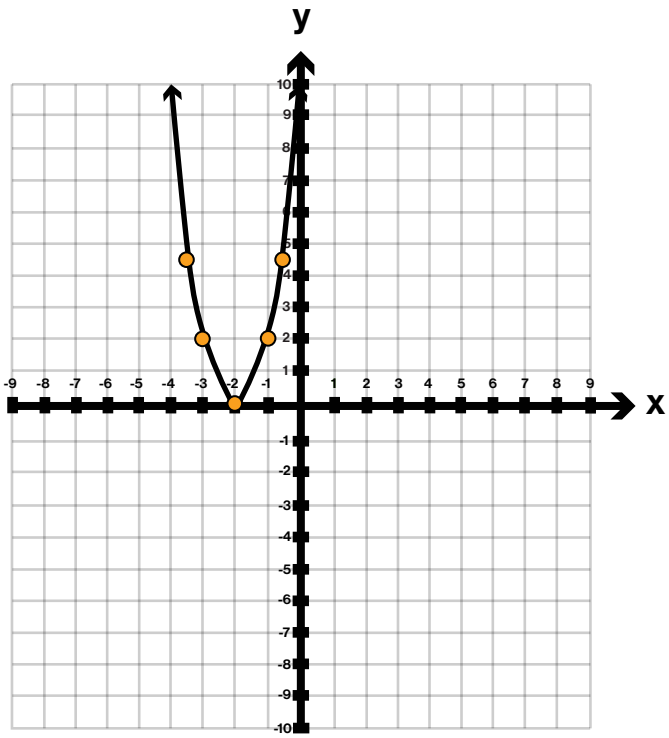


III. $f(x) = 2x^2 + 2$

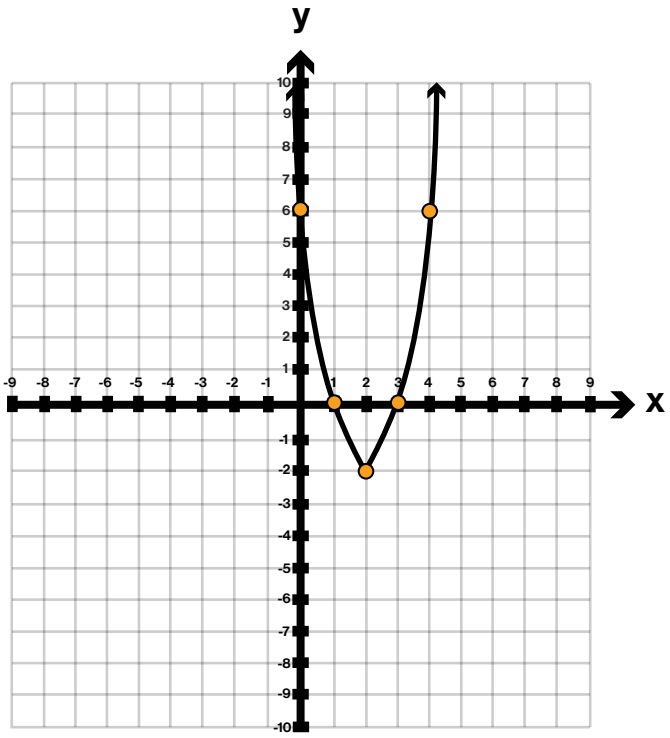


Quadratic Equations Practice

IV. $f(x) = 2(x + 2)^2$

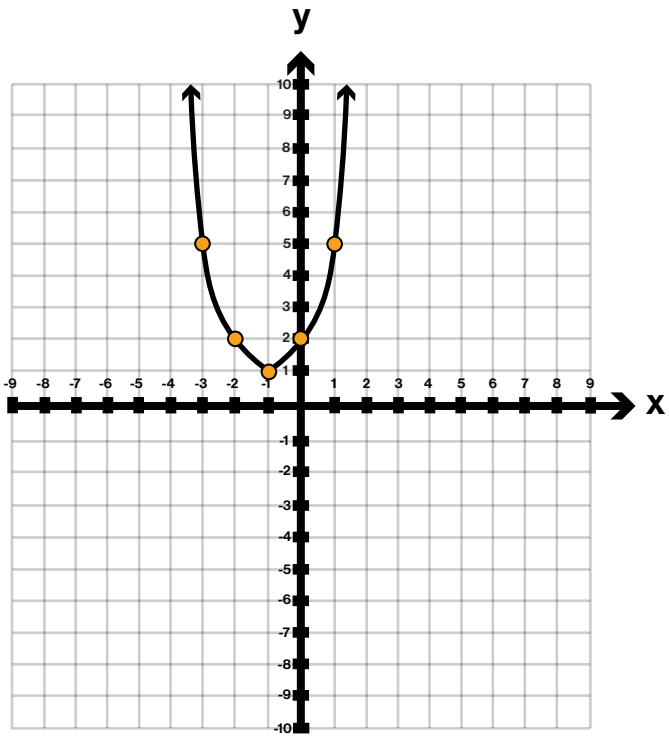


V. $f(x) = 2(x - 2)^2 - 2$



Quadratic Equations Practice

VI. $f(x) = x^2 + 2x + 2 \longrightarrow (2/2)^2 = 1 \longrightarrow (x^2 + 2x + 1 - 1) + 2 \longrightarrow (x^2 + 2x + 1) + (-1 + 2) \longrightarrow (x + 1)^2 + 1$



VII. $f(x) = 2x^2 - 4x - 2 \longrightarrow 2(x^2 - 2x) - 2 \longrightarrow (-2/2)^2 = 1 \longrightarrow 2(x^2 - 2x + 1 - 1) - 2 \longrightarrow 2(x^2 - 2x + 1) + 2(-1) - 2$

$\downarrow$

$2(x - 1)^2 - 4 \longleftarrow 2(x - 1)^2 + -4$