Pre-Calculus 11

Quadratic Equations Assignment

Name: KEY

Date: _____

Block: ____

1. Solve the following by graphing.

$(x^2 + 5x) + 4 = 0$

$\left(\frac{5}{2}\right)^2 = \frac{25}{4}$

$\left(x^2 + 5x + \frac{25}{4} - \frac{25}{4}\right) + 4 = 0$

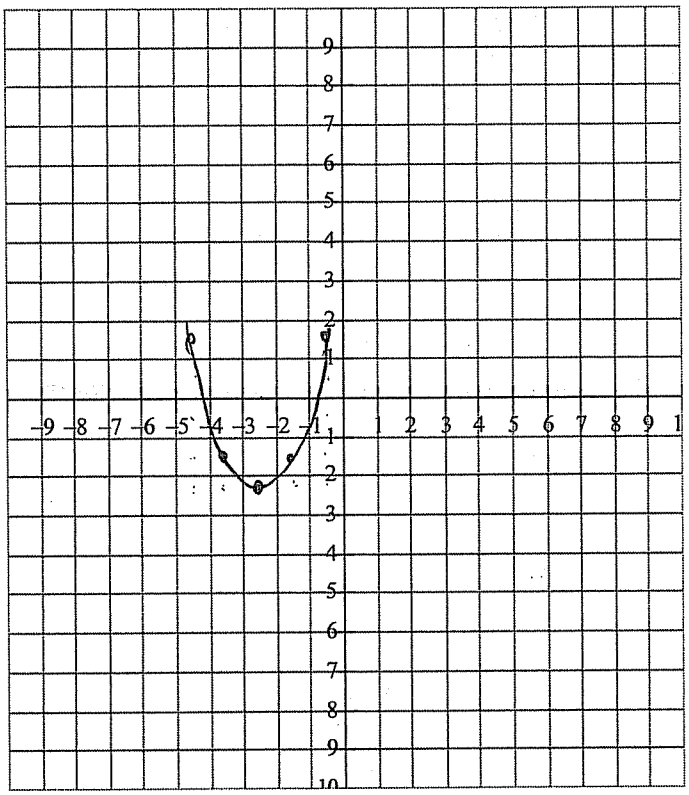
$\left(x^2 + 5x + \frac{25}{4}\right) - \frac{25}{4} + 4 = 0$

$\left(x + \frac{5}{2}\right)^2 - \frac{25}{4} + \frac{16}{4} = 0$

$\left(x + \frac{5}{2}\right)^2 - \frac{9}{4} = 0$

Roots → estimated

$-4.25, -0.75$



2. Solve each equation by factoring.

(a) $x^2 + 7x + 10 = 0$

$m: 10 \quad 5, 2$

$A: 7$

$(x+5)(x+2) = 0$

$x+5 = 0 \qquad x+2 = 0$

$x = -5 \qquad x = -2$

(b) $x^2 - x = 6$

$-6 \quad -6$

$x^2 - x - 6 = 0$

$m: -6 \quad -3, 2$

$A: -1$

$(x-3)(x+2) = 0$

$x-3 = 0 \qquad x+2 = 0$

$x = 3 \qquad x = -2$

(c) $8x^2 = 72x - 144$

$-72x \quad -144 \quad -72x \quad +144$

$8x^2 - 72x + 144 = 0$

$8(x^2 - 9x + 18) = 0$

$m: 18 \quad -6, -3$

$A: -9$

$8(x-6)(x-3) = 0$

$x-6=0 \quad x=6$

$x-3=0 \quad x=3$

(d) $5x^2 + 20 = -25x$

$+25x \quad +25x$

$5x^2 + 25x + 20 = 0$

$5(x^2 + 5x + 4) = 0$

$m: 4 \quad 4, 1$

$A: 5$

$5(x+4)(x+1) = 0$

$x+4=0 \quad x=-4$

$x+1=0 \quad x=-1$

(e) $4x^2 + 8x + 3 = 0$

$m: 4 \times 3 = 12 \quad 6, 2$

$A: 8$

$4x^2 + 6x + 2x + 3 = 0$

$2x(2x+3) + 1(2x+3) = 0$

$(2x+1)(2x+3) = 0$

$2x+1=0 \quad -1 \quad -1$

$\frac{2x}{2} = \frac{-1}{2} \quad x = -\frac{1}{2}$

$2x+3=0$

$2x = -3$

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

(f) $2x^2 - 5x = 0$

$x(2x-5) = 0$

$x = 0$

$2x - 5 = 0$

$2x = 5$

$x = 5/2$

3. Solve each equation by taking square roots.

(a) $8x^2 - 7 = 249$

$+7 \quad +7$

$\frac{8x^2}{8} = \frac{256}{8}$

$x^2 = 32$

$x = \pm\sqrt{32}$

$x = \pm 4\sqrt{2}$

(b) $9x^2 - 10 = 90$

$+10 \quad +10$

$\frac{9x^2}{9} = \frac{100}{9}$

$x^2 = \frac{100}{9}$

$x = \pm\sqrt{\frac{100}{9}}$

$x = \pm\frac{\sqrt{100}}{\sqrt{9}}$

$x = \pm\frac{10}{3}$

4. Write a quadratic equation that has the following solutions.

(a) -5, 7

$x = -5 \quad +5 \quad +5$

$x + 5 = 0$

$x = 7 \quad -7 \quad -7$

$x - 7 = 0$

$(x+5)(x-7) = 0$

$x^2 - 7x + 5x - 35 = 0$

$x^2 - 2x - 35 = 0$

(b) $2, \frac{4}{3}$

$x = 2 \quad -2 \quad -2$

$(x-2) = 0$

$x = 4/3 \quad \times 3 \quad \times 3$

$3x = 4 \quad -4 \quad -4$

$3x - 4 = 0$

$(x-2)(3x-4) = 0$

$3x^2 - 4x - 6x + 8 = 0$

$3x^2 - 10x + 8 = 0$

c) $1 - \sqrt{5}, \; 1 + \sqrt{5}$

$x = 1 \pm \sqrt{5}$

$(x-1) = (\pm\sqrt{5})^2$

$x^2 - 2x + 1 = 5 \quad -5 \quad -5$

$x^2 - 2x - 4 = 0$

5. Solve each equation by completing the square.

(a) $(3x^2 - 12x) + 9 = 0$

$\left(\frac{-4}{2}\right)^2$

$(-2)^2$

4

$3(x^2 - 4x \quad) + 9 = 0$

$3(x^2 - 4x + 4 - 4) + 9 = 0$ (×3)

$3(x^2 - 4x + 4) - 12 + 9 = 0$

$3(x-2)^2 - 3 = 0$

$+3 \quad +3$

$\frac{3(x-2)^2}{3} = \frac{3}{3}$

$(x-2)^2 = 1$

$x - 2 = \pm\sqrt{1}$

$x - 2 = \pm 1$

$x - 2 = 1$ $\quad +2 \quad +2$

$x = 3$

$x - 2 = -1$ $\quad +2 \quad +2$

$x = 1$

(b) $(x^2 - 12x) + 31 = 0$

$\left(\frac{-12}{2}\right)^2$

$(-6)^2$

36

$(x^2 - 12x + 36 - 36) + 31 = 0$

$(x^2 - 12x + 36) - 36 + 31 = 0$

$(x-6)^2 - 5 = 0$

$+5 \quad +5$

$(x-6)^2 = 5$

$x - 6 = \pm\sqrt{5}$

$x = \pm\sqrt{5} + 6$

6. Use the discriminant to determine the number of solutions to each question.

(a) $2x^2 - 9x + 4 = 0$

$b^2 - 4ac = (-9)^2 - 4(2)(4)$

$= 81 - 32$

$= 49$

$\Rightarrow$ 2 solutions

(b) $-6x^2 + 7x - 5 = 0$

$b^2 - 4ac = (7)^2 - 4(-6)(-5)$

$= 49 - 120$

$= -71$

$\Rightarrow$ no solutions

(c) $-6x^2 - 3x + 9 = 0$

$b^2 - 4ac = (-3)^2 - 4(-6)(9)$

$= 9 + 216$

$= 225$

$\Rightarrow$ 2 solutions

(d) $-x^2 - 6x - 9 = 0$

$b^2 - 4ac = (-6)^2 - 4(-1)(-9)$

$= 36 - 36$

$= 0$

$\Rightarrow$ 1 solution

7. Solve each equation with the quadratic formula.

(a) $4x^2 - 3x - 27 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{-(-3) \pm \sqrt{(-3)^2-4(4)(-27)}}{2(4)}$

$= \frac{3 \pm \sqrt{441}}{8}$

$= \frac{3 \pm 21}{8}$

$x = \frac{3+21}{8}$

$x = \frac{24}{8}$

$x = 3$

$x = \frac{3-21}{8}$

$= -\frac{18}{8}$

$= -\frac{9}{4}$

(b) $x^2 - 10x + 22 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-(-10) \pm \sqrt{(-10)^2-4(1)(22)}}{2(1)}$

$x = \frac{10 \pm \sqrt{12}}{2}$

$x = \frac{10 \pm 2\sqrt{3}}{2}$

$x = 5 \pm \sqrt{3}$

8. Solve the following.

(a) $x - 1 = \frac{2}{x}$ $\cdot x$

$x^2 - 1x = 2$

$-2 \quad -2$

$x^2 - 1x - 2 = 0$

$m = -2 \quad -2, 1$

$A = -1$

$(x-2)(x+1) = 0$

$x - 2 = 0 \qquad x + 1 = 0$

$x = 2 \qquad x = -1$

(b) $x(2x-3) + 4(x+1) = 2(3+2x)$

$2x^2 - 3x + 4x + 4 = 6 + 4x$

$2x^2 + 1x + 4 = 6 + 4x$

$-4x \quad -6 \quad -6 \quad -4x$

$2x^2 - 3x - 2 = 0$

$m = -4 \quad -4, 1$

$A = -3$

$2x^2 - 4x + 1x - 2 = 0$

$2x(x-2) + 1(x-2) = 0$

$(2x+1)(x-2) = 0$

$2x + 1 = 0 \qquad x - 2 = 0$

$-1 \quad -1 \qquad +2 \quad +2$

$\frac{2x}{2} = \frac{-1}{2} \qquad x = 2$

$x = -\frac{1}{2}$

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9. When a football is kicked, its height can be modeled by the function $h(d) = -0.1d^2 + 4.8d$, where d is the horizontal distance that the ball has travelled from the kicker, in metres, and h is the height of the ball, in metres. Find the distance from the kicker that the ball lands on the ground again. Show all work. (4 marks)

lands $\Rightarrow$ height = 0

$0 = -0.1d^2 + 4.8d$

$0 = -0.1d(d - 48)$

$-0.1d = 0$ or $d - 48 = 0$

$d = 0$ or $d = 48$

Ball lands 48 m from the kicker.

10. A temporary rectangular dog pen measures 6 feet by 8 feet. Bree wants to triple the area of the pen by moving each wall by the same amount.

a) Sketch and label a diagram for this situation. (2 marks)

$A = L \times W$

$144 = (8+x)(6+x)$

$144 = 48 + 14x + x^2$

$0 = x^2 + 14x - 96$

* Not factorable *

$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-14 \pm \sqrt{(14)^2 - 4(1)(-96)}}{2}$

$x = \frac{-14 \pm \sqrt{580}}{2}$

$x = 5.09$

-96

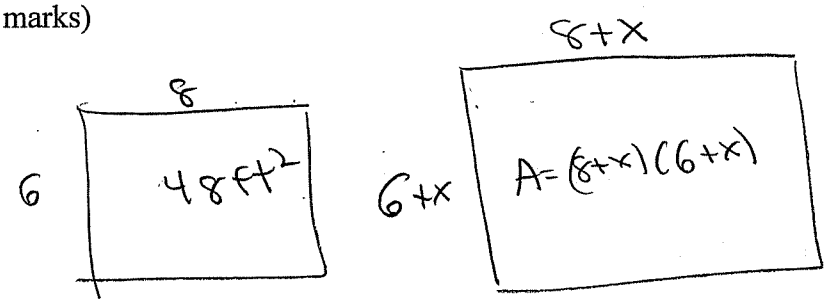
$2 \quad 48$

$2 \quad 24$

$2 \quad 12$

$2 \; 2 \; 3$

b) Write an equation and solve it to find the dimensions of the new pen. Show all work. (3 marks)



#11. Let w = width

$w+2$ = length

15 = height

$$V = L \times w \times h$$

$$2145 = (w+2)(w)(15)$$

$$2145 = (w^2+2w)(15)$$

$$2145 = 15w^2+30w$$

$$0 = 15w^2+30w-2145$$

$$0 = 15(w^2+2w-143)$$

$a=1 \quad b=2 \quad c=-143$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-2 \pm \sqrt{(2)^2-4(1)(-143)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4+572}}{2}$$

$$x = \frac{-2 \pm \sqrt{576}}{2}$$

$$x = \frac{-2 \pm 24}{2}$$

$$x = \frac{-2-24}{2}$$

$$x = \frac{-2+24}{2}$$

$$x = \frac{22}{2}$$

$$x = 11$$

width = 11 m

length = 11 + 2

= 13 m