

HOMEWORK

3

4.3

5. Parabola 6. axis of symmetry

7.  $-\frac{b}{2a}$  8. True

9. True 10. True

11.  $x^2 - 1 \quad 0 - 0 - 1 = -1$

$x=0 \quad y=-1$

$-\frac{0}{2} = 0$

A = 1

B = 0

C = -1

Answer = C

12.  $\underline{x^2 - 1} \quad -\frac{b}{2a} \quad \frac{0}{-2} \quad x=0 \quad y=-1$

A = -1

B = 0

C = -1

Answer = E

13.  $x^2 - 2x + 1 \quad x=1 \quad 1 - 2 + 1 = 0$

A = 1

B = -2

C = 1

$\frac{-2}{2} = 1 \quad (1, 0)$

Answer = F

14.  $x^2 + 2x + 1 \quad x = -1 \quad 1 - 2 + 1 = 0$

A = 1

B = 2

C = 1

$\frac{-2}{2} = -1 \quad (-1, 0)$

Answer = A

$$15. x^2 - 2x + 2 \quad \frac{2}{2} = 1 \quad x=1 \quad 1-2+2 = 1$$

$$A=1 \quad (1, 1)$$

$$B=-2$$

$$C=2$$

Answer = C

$$16. x^2 + 2x \quad \frac{-2}{2} = -1 \quad x=-1 \quad 1-2+0$$

$$A=1$$

$$B=2$$

$$C=0$$

Answer = B

$$17. x^2 - 2x \quad \frac{2}{2} = 1 \quad x=1 \quad 1-2=-1$$

$$A=1$$

$$B=-2$$

$$C=0$$

Answer = H

$$18. x^2 + 2x + 2 \quad \frac{-2}{2} = -1 \quad x=-1 \quad 1-2+2$$

$$A=1$$

$$B=2$$

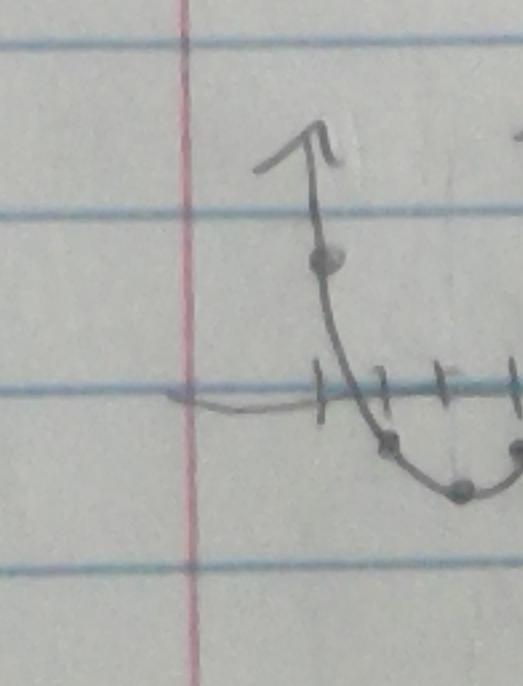
$$C=2$$

Answer = D

21. Start with  $y = x^2$

$$f(x) = (x+2)^2 - 2$$

$$\text{vertex} = (-2, -2)$$



23.  $x^2 + 4x + 2$

$$A=1 \quad h = \frac{-4}{2} = -2 \quad (-4, 2) \quad (0, 2)$$

$$B=4 \quad k = 4 - 8 + 2 = -2 \quad (-3, 1) \quad (1, 1)$$

$$C=2 \quad (x+2)^2 - 2 \quad (-2, 2)$$

$$x=1 \quad y=2$$

$$16 - 8 = 8 > 0 \quad x \text{ has } 2 \text{ intercepts}$$

27.  $-x^2 - 2x$

$$\frac{-(-2)}{2(-1)} = \frac{2}{-2} = -1$$

$$h = -1 \quad (-1, 1)$$

$$(-2, 0) \quad (0, 0)$$

$$-(-1)^2 - 2(-1) \quad -2^2 - 4(-1)(0)$$

$$-1 + 2 = 1 \quad k = 1 \quad 4 > 0 \quad \text{two } x \text{ intercepts}$$

33.  $-x^2 - 6x$        $h = -3 \quad k = 9$

(g)  $(-3, 9)$

$$\frac{b}{2} = \frac{-6}{2} = -3 \quad -9 + 18 + 0 = 9$$

axis of symmetry = -3

$$y\text{-intercept} = 0 \quad 36 > 0 \quad \text{two } x \text{ intercepts}$$

use axis of sym. + point  $(0, 0)$   
to find  $x$

$$35. \quad x^2 + 2x - 8$$

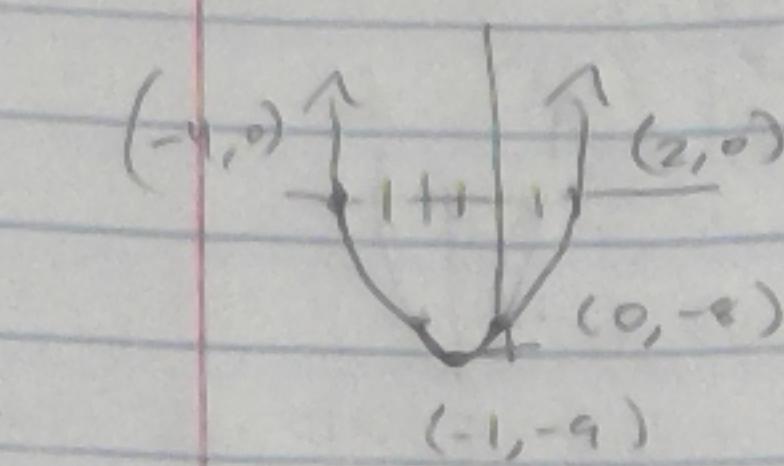
$$h = -1 \quad k = -9$$

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

$$\text{vertex} = (-1, -9)$$

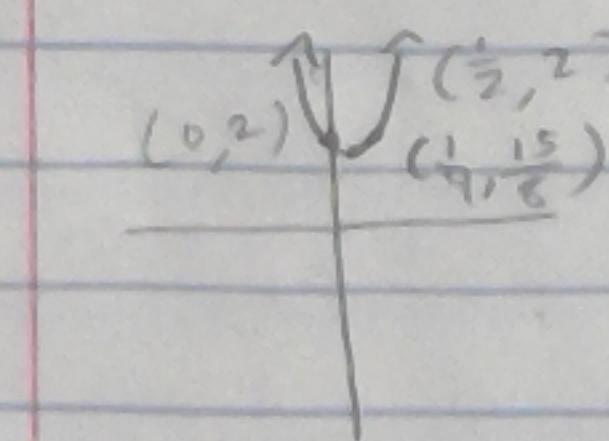
$$y\text{-intercept} = -8$$

$$x\text{-intercept} = (-4, 0) \quad (2, 0)$$



$$39. \quad 2x^2 - x + 2 \quad \frac{1}{4} \quad h = \frac{1}{4} \quad k = \frac{15}{8}$$

$$(a) \quad \text{vertex} = \left(\frac{1}{4}, \frac{15}{8}\right)$$



$$(b) \quad D = (-\infty, \infty)$$

$$R = \left[\frac{15}{8}, \infty\right)$$

(c) increasing  $(\frac{1}{4}, \infty)$   
decreasing  $(-\infty, \frac{1}{4})$

$$41. \quad -2x^2 + 2x - 3 \quad \frac{-2}{-4} = \frac{1}{2} \quad h = \frac{1}{2}$$

$$-\frac{1}{2} + 1 - 3 \quad k = -2\frac{1}{2}$$

$$(a) \quad \text{vertex} = \left(\frac{1}{2}, -2\frac{1}{2}\right)$$

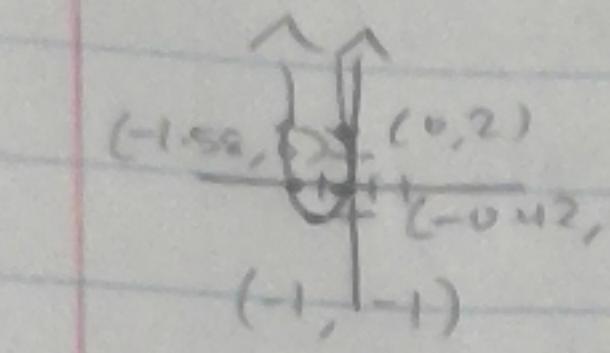
$$y\text{-intercept} = -3$$

$$(b) \quad D = (-\infty, \infty)$$

$$R = \left(-\infty, -\frac{5}{2}\right]$$

(c) Increasing  $(-\infty, \frac{1}{2})$   
Decreasing  $(\frac{1}{2}, -\infty)$

$$43. \quad 3x^2 + 6x + 2 \quad -\frac{b}{a} = -1 \quad V = -1 \quad 3(-1)^2 = -1$$



vertex =  $(-1, -1)$

y-intercept =  $(0, 2)$

$$(a) \quad 36 - 4(3)(2) = 12 > 0$$

*x has no intercepts*

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

$$\begin{aligned} x &= -1.58 \text{ or} \\ x &= -0.42 \end{aligned}$$

$$(b) \quad D = (-\infty, \infty) \\ R = [-1, \infty)$$

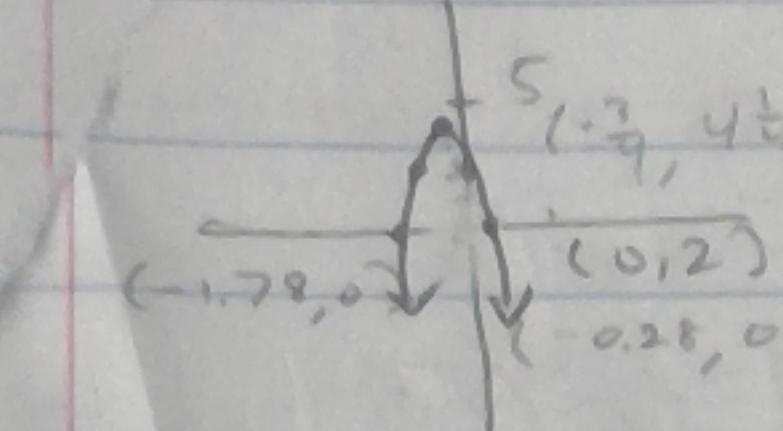
(c) Increasing  
 $(-1, \infty)$

Decreasing  
 $(-\infty, -1)$

$$k = 4\frac{1}{4}$$

$$45. \quad -4x^2 - 6x + 2 \quad n = -\frac{3}{4} \quad -2\frac{1}{4} + 4\frac{1}{2} + 2 = 4\frac{1}{4}$$

$$\frac{b}{-8} = -\frac{3}{4} \quad \text{vertex} = \left(-\frac{3}{4}, 4\frac{1}{4}\right)$$



(a)

y-intercept =  $(0, 2)$

$$36 - 4(-4)(2)$$

$$36 + 32 = 68 > 0$$

*x has two intercepts*

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad x = -1.78 \text{ or} \\ x = -0.28$$

$$(b) \quad D = (-\infty, \infty) \\ R = \left(-\infty, \frac{17}{4}\right]$$

(c) Increasing  $(-\infty, -\frac{3}{4})$   
Decreasing  $(-\frac{3}{4}, \infty)$

$$53. 2x^2 + 12x \quad \frac{-12}{4} = -3 \quad 18 - 36 = -18$$

Minimum value at -18

$$55. 2x^2 + 12x - 3 \quad \frac{-12}{4} = -3 \quad 18 - 36 - 3 = -21$$

Minimum value at -21

$$59. -3x^2 + 12x + 1 \quad \frac{-12}{-6} = 2 \quad -12 + 24 + 1 = 13$$

Maximum value at 13

$$\begin{aligned} 69. (a) \quad a = 1: f(x) &= (x+3)(x-1) = x^2 + 2x - 3 \\ a = 2: f(x) &= 2(x+3)(x-1) = 2x^2 + 4x - 6 \\ a = -2: f(x) &= -2(x+3)(x-1) = -2x^2 - 4x + 6 \\ a = 5: f(x) &= 5(x+3)(x-1) = 5x^2 + 10x - 15 \end{aligned}$$

(b)  $a$  does not affect the  $x$ -intercepts but changes  $y$ -intercept by  $\times a$

(c)  $a$  does not affect axis of symmetry  
It is  $x = -1$  for all values of  $a$

(d) Value of  $a$  does not affect the  $x$ -coordinate of the vertex.  $y$ -coordinate of vertex is multiplied by  $a$

(e) The mean of the  $x$ -intercepts is the  $x$ -coordinate of the vertex

79. (a) 187 or 188 matches; \$7031.20

$$(b) P(x) = -0.2x^2 + 43x - 1750$$

(c) 107 or 108 matches; \$5561.20

81. (a) 171 ft (b) 49 mph

(c) Reaction time

4.5

3. (a)  $\{x \mid x < -2 \text{ or } x > 2\}$   
 (b)  $\{x \mid -2 \leq x \leq 2\}$

4. (a)  $\{x \mid x < -1 \text{ or } x > 4\}$   
 (b)  $\{x \mid -1 \leq x \leq 4\}$

5.

6.

7.  $x^2 - 3x - 10 < 0$   
 $(x-5)(x+2)$

y-intercept = -10  
 x-intercepts = 5, -2  
 $\{x \mid -2 < x < 5\}$

11.  $x^2 - 9 < 0$   
 $(x-3)(x+3)$

x-intercepts = -3, 3  
 $\{x \mid -3 < x < 3\}$

13.  $x^2 + x > 12$

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

x-intercepts = -4, 3  
 $\{x < -4 \text{ or } x > 3\}$

17.  $x^2 - x + 1 \leq 0$   
 $\frac{-1}{2} = \frac{1}{4}$

No real solution

19.  $4x^2 - 6x + 9 < 0$   
 $4(x-3)(x-3)$  (No real solutions)

23.  $\{x | x \leq 4 \text{ or } x \geq 4\}$   $(-\infty, -4] \cup [4, \infty)$

25. (a)  $0 - 1 = -1$   $\{ -1, 1 \}$  (b)  $\{ -1 \}$   
(c)  $\{ -1, 4 \}$  (d)  $\{x | x < -1 \text{ or } x > 1\}$ ;  $(-\infty, -1)$   
or  $(1, \infty)$  (e)  $\{x | x \leq -1\}$  or  $(-\infty, -1]$   
(f)  $\{x | x \leq -\sqrt{2} \text{ or } x \geq \sqrt{2}\}$ ;  $(-\infty, -\sqrt{2}] \cup [\sqrt{2}, \infty)$   
(g)  $\{x | x \leq -\sqrt{2} \text{ or } x \geq \sqrt{2}\}$ ;  $(-\infty, -\sqrt{2}] \cup [\sqrt{2}, \infty)$

33. (a) 5 seconds (b) 96 ft above  
the ground for  $t$   
 $t+2$  and  $3$  sec,

35. (a) \$0, \$1000

$2 < t < 3$

(b) \$800,000 for prices  
at \$276.39 and \$723.61,  
\$276.39 < p < \$723.61