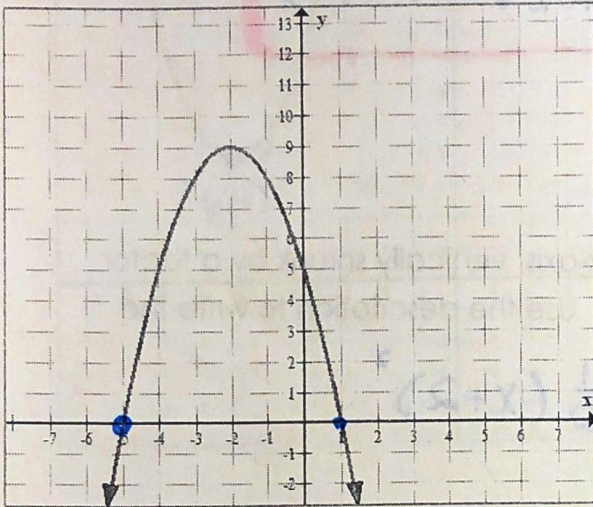


1) Characteristics:



Determine the following:

zeroes:  $x = -5$   $x = 1$

y-intercept:  $(0, 5)$

Range:  $(-\infty, 9]$

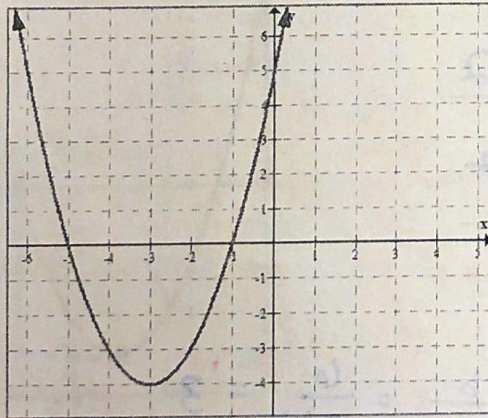
Vertex:  $(-2, 9)$

Vertex form:  $y = -(x+2)^2 + 9$

Intercept form:  $y = -(x+5)(x-1)$

Standard form:  $y = -x^2 + 4x + 5$

2)



Determine the following:

zeroes:  $x = -5$   $x = -1$

y-intercept:  $(0, 5)$

Range:  $[-4, \infty)$

Vertex:  $(-3, -4)$

Vertex form:  $y = (x+3)^2 - 4$

Intercept form:  $y = (x+5)(x+1)$

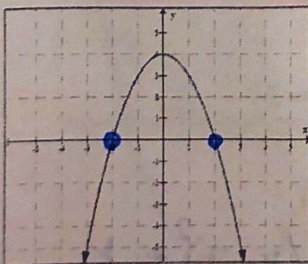
2) State whether the a value is positive or negative for each quadratic. Then state the zeroes of each.

$a = -$

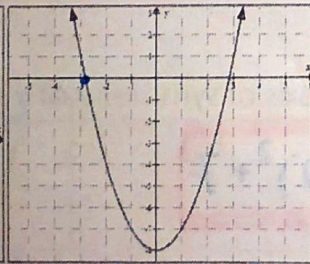
$a = +$

$a = +$

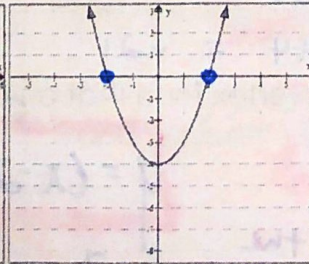
$a = +$



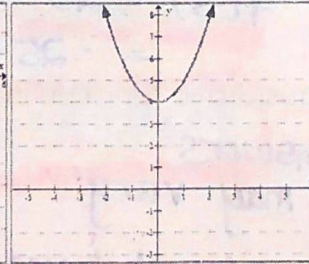
$x = -2$   $x = 2$



$x = -2.7$   $x = 2.7$



$x = 2$   $x = -2$



none

3) State the transformations that have occurred to the parent function, and state the vertex.

$y = 2(x + 4)^2 + 7$  → up 7

↓

Stretch of 2      Left +4

**vertex @ (-4, 7)**

5) The parent function  $f(x) = x^2$  is reflected over the x-axis, vertically shrunk by a factor of  $\frac{1}{2}$  and translated left 2 units to create function  $g(x)$ . Use the description to write the quadratic function  $g(x)$  in vertex form.

$g(x) = -\frac{1}{2}(x+2)^2$

6) Write a quadratic function in vertex form....  
Answers may vary ↴

• that has a vertex below the x-axis:  $y = x^2 - 9$

• that has a vertex above the x-axis:  $y = x^2 + 2$

• that has a vertex on the x-axis:  $y = (x-2)^2$   
 $y = (x+3)^2$   
 $y = x^2$

$y = a(x-h)^2 - k$   
 $y = a(x-h)^2 + k$   
 $y = a(x-h)^2 + 0$  ← no vertical shift

7) Find the vertex of the function  $f(x) = x^2 - 6x + 14$ .  $\frac{-b}{2a} = \frac{6}{2(1)} = 3$

$f(3) = 9 - 18 + 14$   
 $= -9 + 14 = 5$

**(3, 5)**

8) Find the vertex of  $y = x^2 + 10x + 4$ ?  $\frac{-b}{2a} = \frac{-10}{2(1)} = -5$

$f(-5) = 25 - 50 + 4$   
 $= -25 + 4 = -21$

**(-5, -21)**

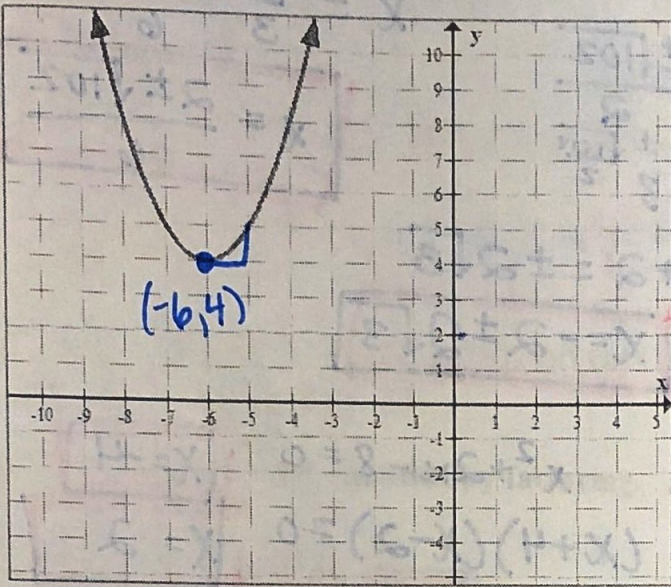
9) Write a quadratic function in vertex form that an axis of symmetry of  $x = 2$ ?

Answers may vary:  
must have the  $y = (x-2)^2$  part

**$y = (x-2)^2 + 7$**

$y = a(x-2)^2 + k$   
↑  
Any numbers allowed

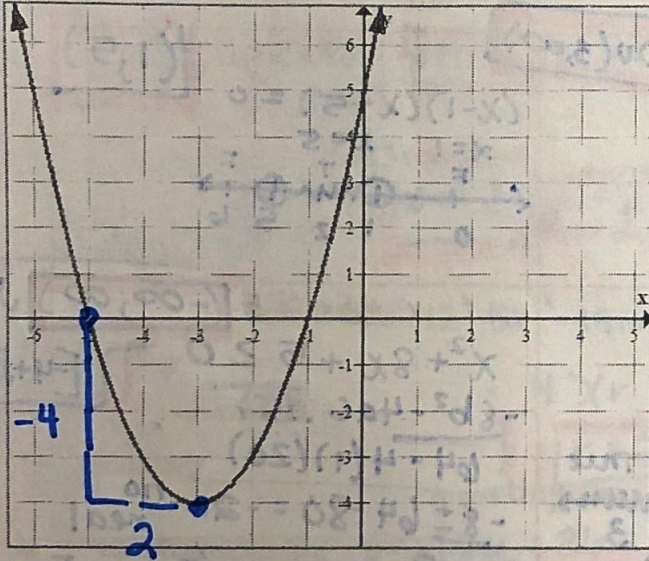
10) Identify the vertex of this parabola. Write the equation in vertex form and standard form.



Vertex form:  $y = (x+6)^2 + 4$   
 $x^2 + 12x + 36 + 4$

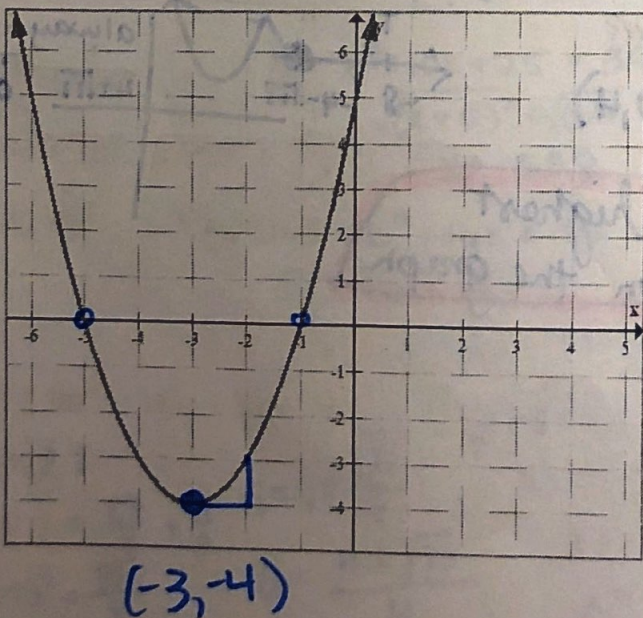
Standard form:  $y = x^2 + 12x + 40$

11) Calculate the average rate of change on the interval from  $[-5, -3]$ .



$m = \frac{-4}{2} = -2$

12) Write the equation for the graph shown below.



Vertex form:  $y = (x+3)^2 - 4$

Intercept form:  $y = (x+5)(x+1)$

Standard form:  $y = x^2 + 6x + 5$

13) Solve by any method:

**Quad formula work is on last page!**

$$4(3x - 1)^2 - 17 = 85.$$

Square Roots

$$4(3x - 1)^2 = 102$$

$$\sqrt{(3x - 1)^2} = \sqrt{\frac{102}{4}}$$

$$(3x - 1) = \frac{\pm\sqrt{102}}{2}$$

$$3x = 1 \pm \frac{\sqrt{102}}{2}$$

$$x = \frac{1 \pm \sqrt{102}}{6}$$

$$x = \frac{2 \pm \sqrt{102}}{6}$$

14) Solve by completing the square  $x^2 + 4x = 8$

$$x^2 + 4x + 4 = 8 + 4$$

$$\sqrt{(x + 2)^2} = \sqrt{12}$$

$$x + 2 = \pm 2\sqrt{3}$$

$$x = -2 \pm 2\sqrt{3}$$

15) Solve by any method:

$$x^2 + 2x = 8$$

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

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

$$x = -4$$

$$x = 2$$

16) Solve the inequalities, state your final answer in interval notation:

a.  $-x^2 + 6x + 7 > 0$   **$(-1, 7)$**

$$x^2 - 6x - 7 < 0$$

$$(x - 7)(x + 1) = 0$$

b.  $x^2 - 3x > 0$   **$(-\infty, 0) \cup (3, \infty)$**

$$x(x - 3) > 0$$

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

c.  $x^2 - 6x + 5 < 0$   **$(1, 5)$**

$$(x - 1)(x - 5) = 0$$

$$x = 1 \quad x = 5$$

d.  $6x^2 + x \leq 35$   **$[-\frac{5}{2}, \frac{7}{3}]$**

$$6x^2 + x - 35 \leq 0$$

$$(2x + 5)(3x - 7) = 0$$

$$x = -\frac{5}{2} \quad x = \frac{7}{3}$$

e.  $6x^2 + x \geq 35$

$$6x^2 + x - 35 \geq 0$$

$$x = -\frac{5}{2} \quad x = \frac{7}{3}$$

f.  $x^2 + 8x \geq -5$   **$(-\infty, -4 - \sqrt{11}] \cup [-4 + \sqrt{11}, \infty)$**

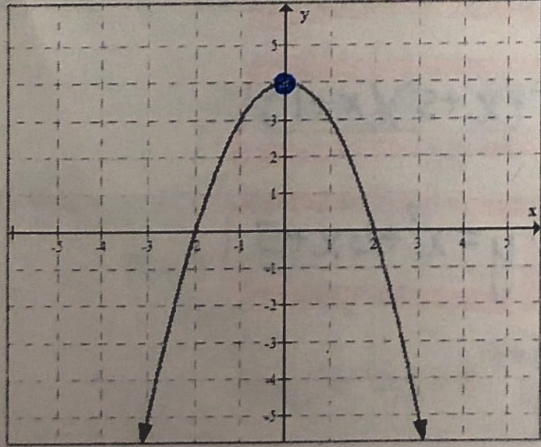
$$x^2 + 8x + 5 \geq 0$$

$$\frac{-8 \pm \sqrt{64 - 4(1)(5)}}{2(1)} = x$$

$$\frac{-8 \pm \sqrt{44}}{2} = \frac{-8 \pm 4\sqrt{11}}{2}$$

$$x = -4 \pm \sqrt{11}$$

17) What is the maximum value on the graph below?



**max @ (0, 4)**

**4 is the highest y-value on the graph**

18)

$$y = -1(x+0)^2 + 3$$

$$y = -x^2 + 3$$

vertex (0,3)

Find the vertex, and state the type of extrema.

$(-a) \rightarrow$  maximum

19) Write a quadratic function has an axis of symmetry of  $x = 5$  and a minimum value of  $-2$ ?

Solving: Solve each equation by factoring.

$x^2 - 8x + 7 = 0$  1)  $x^2 = -8x - 7$

$(x-1)(x-7) = 0$   $x=1$   $x=7$

$n^2 + 10n + 21 = 0$  3)  $n^2 = -21 - 10n$

$(n+7)(n+3) = 0$   $n=-7$   $n=-3$

$4x^2 - 5x - 6 = 0$  5)  $4x^2 - 6 = 5x$

$(4x+3)(x-2) = 0$   $x = -\frac{3}{4}$   $x=2$

7)  $5r^2 - 19r = -12$   $5r^2 - 19r + 12 = 0$

$(5r-4)(r-3) = 0$   $r = \frac{4}{5}$   $r=3$

Solve each equation by completing the square.

9)  $k^2 + 12k + 13 = 2$

$k=-1$   $k=-11$

$k^2 + 12k + 36 = -11 + 36$   
 $\sqrt{(k+6)^2} = \sqrt{25}$   
 $k+6 = \pm 5$

11)  $x^2 + 10x - 35 = 4$

$x=3$   $x=-13$

$x^2 + 10x + 25 = 39 + 25$   
 $\sqrt{(x+5)^2} = \sqrt{64}$   
 $x = -5 \pm 8$

✓ 13)  $4k^2 + 16k + 23 = 8$   $4k^2 + 16k = -15$

$k^2 + 4k = -\frac{15}{4}$   
 $k^2 + 4k + 4 = -\frac{15}{4} + \frac{16}{4}$

15)  $8a^2 - 16a - 33 = -6$

$8a^2 - 16a = 27$   
 $a^2 - 2a + 1 = \frac{27}{8} + \frac{8}{8}$   
 $(a-1)^2 = \frac{35}{8}$   
 $a-1 = \pm \frac{\sqrt{35}}{2\sqrt{2}}$   
 $a = 1 \pm \frac{\sqrt{70}}{4}$   
 $a = \frac{4 \pm \sqrt{70}}{4}$

$(k+2)^2 = \frac{1}{4}$   
 $k+2 = \pm \frac{1}{2}$   
 $x = -2 \pm \frac{1}{2}$   
 $x = \frac{-4 \pm 1}{2}$   
 $x = \frac{5}{2}$   $x = \frac{3}{2}$

2)  $x^2 - 13x = -42$   $x^2 - 13x + 42 = 0$

$(x-7)(x-6) = 0$   
 $x=7$   $x=6$

4)  $v^2 = 16$   $v^2 - 16 = 0$

$(v+4)(v-4) = 0$   
 $v=-4$   
 $v=4$

6)  $3n^2 - 14 = -n$   $3n^2 + n - 14 = 0$

$(3n+7)(n-2) = 0$   
 $n = -\frac{7}{3}$   $n=2$

8)  $3p^2 + 8 = 14p$

$(3p^2 + 14p + 8) = 0$   
 $(3p+2)(p+4) = 0$   
 $p = -\frac{2}{3}$   $p = -4$

10)  $p^2 + 20p + 42 = 3$

$p^2 + 20p + 100 = -39 + 100$   
 $\sqrt{(p+10)^2} = \sqrt{61}$   
 $p = -10 \pm \sqrt{61}$

12)  $n^2 - 2n - 42 = -7$

$n^2 - 2n + 1 = 35 + 1$   
 $(n-1)^2 = 36$   
 $n = 1 \pm 6$   
 $n = -5$   $n = 7$

14)  $10n^2 + 20n - 14 = -2$

$n = \frac{-5 \pm \sqrt{55}}{5}$

16)  $10a^2 + 20a - 90 = -10$

$n = 2$   $n = -4$

#13

$$4(3x-1)^2 - 17 = 85$$

$$4(3x-1)(3x-1) - 102 = 0$$

$$4(9x^2 - 6x + 1) - 102 = 0$$

$$36x^2 - 24x + 4 - 102 = 0$$

$$\frac{36x^2 - 24x - 98}{2} = \frac{0}{2}$$

$$18x^2 - 12x - 49 = 0$$

$$x = \frac{12 \pm \sqrt{144 - 4(18)(-49)}}{36}$$

$$x = \frac{12 \pm \sqrt{3672}}{36}$$

$$x = \frac{12 \pm 6\sqrt{102}}{36}$$

$$x = \frac{2 \pm \sqrt{102}}{6}$$