Math 20-2

Quadratic Functions, three formats – which one should I use?

$y = ax^2 + bx + c$

$y = a(x - r)(x - s)$

$y = a(x - h)^2 + k$

Skill: to know which format to use to find solve algebraically.

Skill: to find an equation in any format given points and/or properties of the function.

Use algebraic methods to find the properties:

a. Find the zeros of the function, exact values.
b. Find the y-intercept of the function.
c. Find the coordinates of the vertex of the function.
d. Find the range of the function.
e. Write the equation for the axis of symmetry.

1. Given $y = x^2 + 4x - 5$

a) $0 = x^2 + 4x - 5$

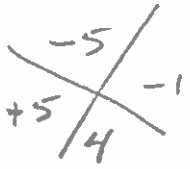
$0 = x^2 + 5x - x - 5$

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

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

$x+5=0 \quad x-1=0$

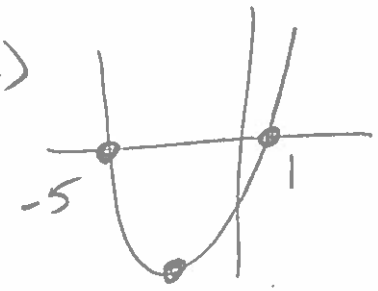
$x=-5 \quad x=1$



b) $y = (0)^2 + 4(0) - 5$

$y = -5$

c)



$V(-2, -9)$

d) $y \geq -9$

e) $x = -2$

2. Given $y = 2x^2 - 4x + 1$

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

$$x = \frac{4 \pm \sqrt{16 - 4(2)(1)}}{2(2)}$$

$$x = \frac{4 \pm \sqrt{8}}{4}$$

$\sqrt{4}\sqrt{2}$

$2\sqrt{2}$

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

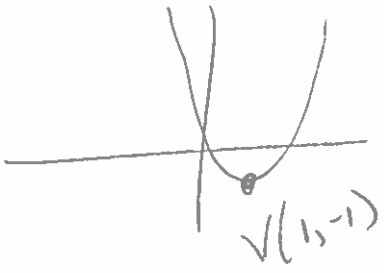
$$x = \frac{2 \pm \sqrt{2}}{2}$$

b) $x = 0$

$y = 2(0)^2 - 4(0) + 1$

$y = 1$

c)



d) $y \geq -1$

e) $x = 1$

3. Given $y = x^2 + 9x + 1$

a) $0 = x^2 + 9x + 1$

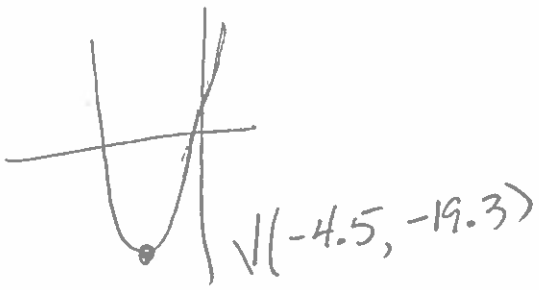
$$x = \frac{-9 \pm \sqrt{81 - 4(1)(1)}}{2(1)}$$

$$x = \frac{-9 \pm \sqrt{77}}{2}$$

b) $y = (0)^2 + 9(0) + 1$

$y = 1$

c)



d) $y \geq -19.3$

e) $x = -4.5$

Find equations and solve problems using quadratic function skills:

1. The function has a vertex at $V(2,-6)$ and passes through the point $P(0,-2)$.
   a. Write the equation in the format $y = a(x-h)^2 + k$
   b. What are the zeros of the function?
   c. What is the range of the function?

a) Vertex $(2,-6)$ ∴ $h=2$ $k=-6$

Point $(0,-2)$ ∴ $x=0$ $y=-2$

$y = a(x-h)^2 + k$ ... find a

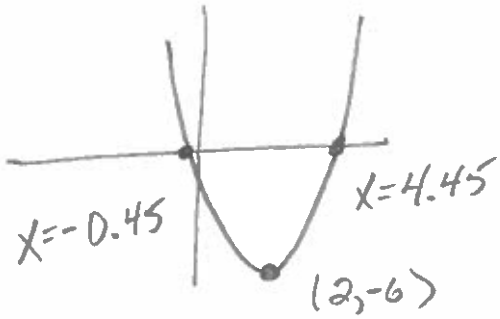
$-2 = a(0-2)^2 - 6$

$-2 = 4a - 6$

$4 = 4a$

$a = 1$ $\quad y = 1(x-2)^2 - 6$

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



c) $y \geq -6$

2. The function has a vertex at $V(2,-6)$ and passes through point $P(0,6)$.
   a. Write the equation in the format $y = a(x-h)^2 + k$
   b. What are the zeros of the function?
   c. What is the equation of the axis of symmetry for the function?

a) $V(2,-6)$ $h=2$ $k=-6$ $\quad y = a(x-2)^2 - 6$

$P(0,6)$ $x=0$ $y=6$ $\quad 6 = a(0-2)^2 - 6$

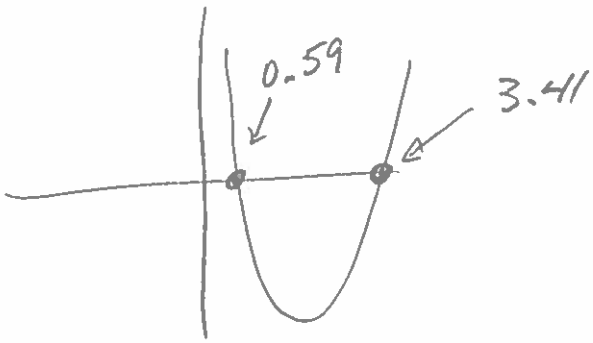
$6 = 4a - 6$

$12 = 4a$

$a = 3$

$y = 3(x-2)^2 - 6$

b)



$x = 0.59$ and $x = 3.41$

c) symmetry through vertex $\quad x = 2$

3. The function has a zeros at $R(-1,0)$ and $S(3,0)$. The function also passes through point $P(5,-6)$.
   a. Write the equation in the format $y = a(x-r)(x-s)$
   b. Write the equation in the format $y = ax^2 + bx + c$
   c. What is the range of the function?

a) ZEROS $(-1,0)$ and $(3,0)$

$y = a(x+1)(x-3)$

Point $P(5,6)$ $x=5$ $y=6$

$6 = a(5+1)(5-3)$

$6 = a(6)(2)$

$6 = 12a$

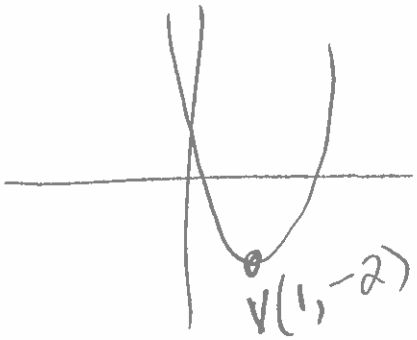
$a = 0.5$ $\quad y = 0.5(x+1)(x-3)$

b) $y = 0.5(x^2 - 3x + x - 3)$

$y = 0.5(x^2 - 2x - 3)$

$y = 0.5x^2 - x - 1.5$

c)



Range

$y \geq -2$