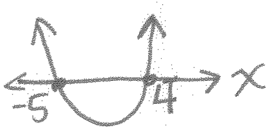
Day 06 5-2 Solving Quadratic Equations by Graphing

1. What are the roots of a quadratic function and how do you find them?

The roots are the solutions to the equation when $y=0$. They are the x-intercepts or the zeros.

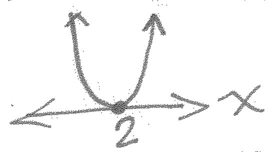
2. Draw a sketch of a quadratic function with the following characteristic. Then write an example of the function(s) in any form that would illustrate your sketch.

a. 2 real roots



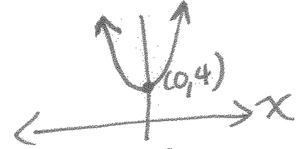
$y=2(x+5)(x-4)$

b. only 1 real root (a double root)



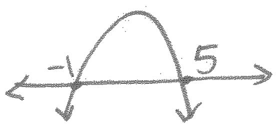
$y=3(x-2)^2$

c. 2 imaginary roots



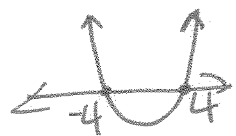
$y=x^2+4$

d. The vertex is a maximum



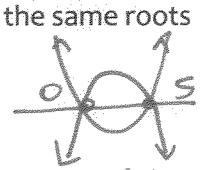
$y=-3(x+1)(x-5)$

e. The vertex is a minimum



$y=\frac{1}{2}(x+4)(x-4)$

f. 2 different functions that have the same roots



$y=x(x-5)$
$y=-x(x-5)$

3. Write the formula for a quadratic function in:

a. General/standard form: $y=ax^2+bx+c$

b. Vertex Form: $y=a(x-h)^2+k$

c. Factored/Intercept Form: $y=a(x-p)(x-q)$

4. Explain how you find the vertex of a quadratic equation when it is in: $(x,y) \Rightarrow (h,k)$

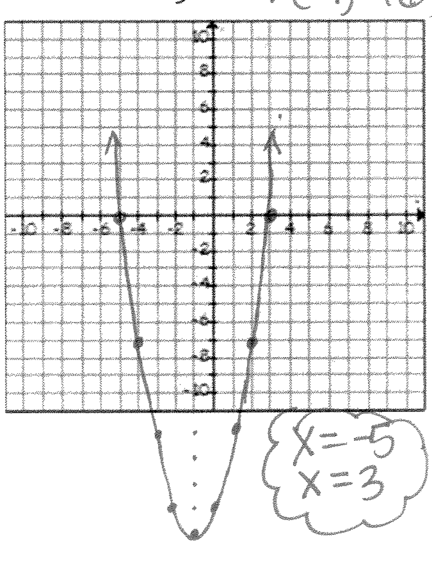
a. General/standard form:
1) Find x w/ $x=\frac{-b}{2a}$
2) Plug x in & solve for y.

b. Vertex Form:
Pick out h & k
$(x-\boxed{h})^2+\boxed{k}$
$V(h,k)$

c. Factored/Intercept Form:
1) Plot the 2 zeros
2) Find x by $\frac{p+q}{2}$
3) Plug in x to find y.

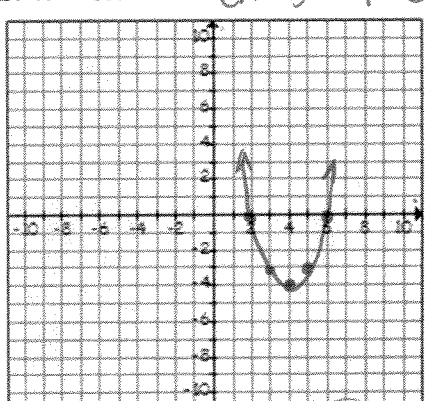
5. Solve each quadratic equation by graphing.

a. $x^2+2x-15=0$ $V(-1,-16)$



$x=-5$
$x=3$

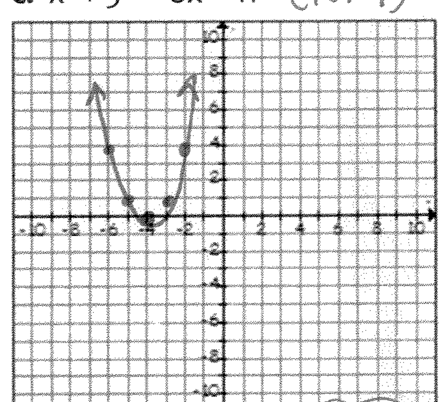
b. $x^2-8x=-12$ $(x-4)^2-4=0$



$x=\frac{8}{2}=4$
$y=16-32+12$
$-16+12$

$x=2$
$x=6$

c. $x^2+5=-8x-11$ $x^2+8x+16$ $(x+4)^2$



$x=\frac{-8}{2}=-4$
$y=16-32+16$
$-16+16$

$x=-4$

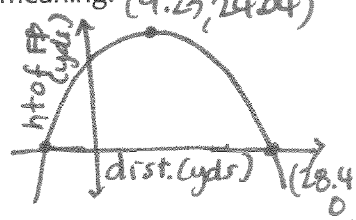
Modeling Quadratics: Do you know how to use your calculator?

Round all answers to the nearest hundredth.

1. On a fourth down, the Cavs are just out of field goal range. Matt needs to kick the football high and short. This punt can be modeled by $y = -0.065x^2 + 1.2x + 18.5$, where x is the distance (in yards) the football is kicked and y is the height (in yards) the football is kicked.

a. Sketch the graph of the quadratic function and label the axes with the real-world meaning.

WINDOW: [-20, 40, 1, -10, 30, 1]



b. Find the greatest height of the football. 24.04 yards

CALC→MAX (9.23, 24.04)

c. When the ball hits the ground, how far is it from where it was kicked?

CALC→ZERO (28.46, 0) 28.46 yards

2. Retail prescription drug sales in the United States increased from 1995 to 2000 as shown in the given table.

Turn on Plot1 (2nd Y=)

PRESS ZOOM 9

a. Write the equation of the quadratic model that best fits your statistical data.

STAT→CALC→5(QUAD.REG.) $y = 1.41x^2 + 7.44x + 68.55$

GO TO Y_1; PRESS VARS→5:STATS→EQ→ENTER ⇒ will put eq in Y_1

b. Predict what the drug sales will cost in 2015. Is this a valid prediction based upon our data?

2015 would be 20 years since 1995; so what is y when x=20?

2ND TRACE→1:VALUE→X=20 $781.64 billion

c. When were the drug sales at the lowest and what was the sales amount at that point? It would be in 1992 and the sales would be $58.74 billion

CALC→3:MIN→ (-2.64, 58.74)

STAT→EDIT→

Years since 1995 L_1	Retail Sales (billions of dollars) L_2
0	68.6
2	89.1
3	103.0
4	121.7
5	140.7

WINDOW: [-25, 25, 1, -10, 152.957,

3. A study compared the speed x (*in miles per hour*) and the average fuel economy y (*in miles per gallon*) for cars. The results are shown in the table below.

a. Write the equation of the quadratic model that best fits your data. Round to 4 dec. places

$y = -.0082x^2 + .7459x + 13.4722$

Speed, x	15	20	25	30	35	40
Fuel economy, y	22.3	25.5	27.5	29.0	28.8	30.0
Speed, x	45	50	55	60	65	70
Fuel economy, y	29.9	30.2	30.4	28.8	27.4	25.3

b. At what speed will the fuel economy be at the maximum amount? 45.50 miles per hour

CALC→MAX→ (45.4987, 30.4406)

c. What is the average fuel economy at that speed? 30.44 miles per gallon

d. What will the fuel economy be when the speed is 100 miles per hour? 6.09 miles per gallon

What is y when x = 100? 6.093032