PreCalculus 11 Date _____

Unit 3: Quadratic Equations

3.1 Graphical Solutions of Quadratic Equations

Quadratic Equation: a 2nd degree equation with standard form $ax^2+bx+c=0 \; ; \; a \neq 0$

ex. $2x^2+12x+16=0$

$3x^2 = -2+5x$

Root(s) of an equation:

- the solution(s) to an equation
- value(s) of the variable that satisfies the equation

Zero(s) of a function:

- the value(s) of $f(x)$ for which $f(x)=0$
- the x-intercept(s) of the graph of $f(x)$

ex. Determine the roots of each equation by graphing by hand:

$x^2 - 8x + 16 = 0$

graph $f(x) = x^2 - 8x + 16$

$= (x^2 - 8x + 16)$ ~~+16 -16~~

$f(x) = (x-4)^2$

vertex (4, 0)

The zero(s) are the roots of the equation.

$x = 4$

$-2x^2 = 8x$

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

$f(x) = 2(x^2+4x+4) - 8$

$= 2(x+2)^2 - 8$

$x = 0, -4$

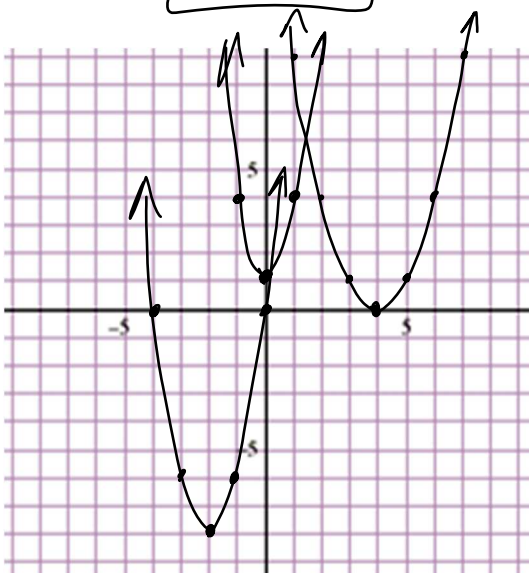
$3x^2 = -1$

$3x^2 + 1 = 0$

$f(x) = 3x^2 + 1$

no zeros

$\therefore$ no roots



Check:

$x^2 - 8x + 16 = 0$

$(4)^2 - 8(4) + 16$

$16 - 32 + 16$

$0 = 0$ ✓

$-2x^2 = 8x$

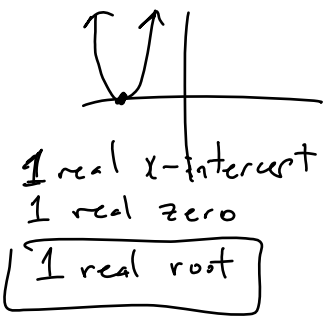
$-2(0)^2 = 8(0)$

$0 = 0$ ✓

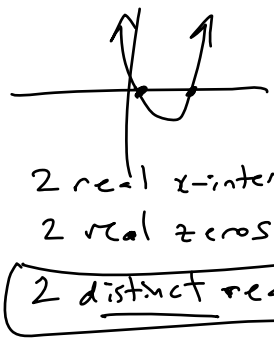
$-2(-4)^2 = 8(-4)$

$-32 = -32$ ✓

Possible number of solutions to a quadratic equation:



1 real x-intercept
1 real zero
1 real root



2 real x-intercepts
2 real zeros
2 distinct real roots

no real x-intercepts
no real zeros
no real roots

ex. The manager of Jasmine's Fine Fashions is investigating the effect that raising or lowering dress prices has on the daily revenue from dress sales. The function $R(x) = 100 + 15x - x^2$ gives the store's revenue *R*, in dollars, from dress sales, where *x* is the price change, in dollars. What price changes will result in no revenue?

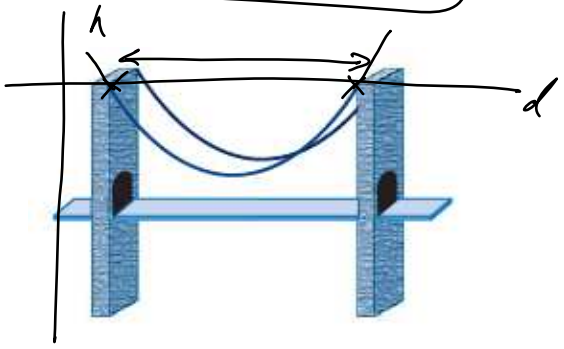
$R(x) = 0$

$100 + 15x - x^2 = 0$

$x = 20$ & $x = -5$

A decrease in price of \$5 OR an increase in price of \$20 will result in no revenue.

ex. The curve of a suspension bridge cable attached between the tops of two towers can be modeled by the function $h(d) = 0.0025(d - 100)^2 - 10$, where *h* is the vertical distance from the top of a tower to the cable and *d* is the horizontal distance from the left end of the bridge, both in meters. What is the horizontal distance between the two towers? Express your answer to the nearest tenth of a meter.



$h(d) = 0$

$0.0025(d-100)^2 - 10 = 0$

$d = 36.75$ & $d = 163.25$

$163.25 - 36.75 =$ 126.5 m

Practice: pg. 215/ #1 – 3, 5 – 8, 10, 12, 13, 16 - 18