SOLVE QUADRATIC EQUATIONS - GRAPHING

LEARNING GOALS

- Review how to solve quadratic equations and graph the roots (x-intercepts).

REVIEW: FACTORING

Factor the following.

$x^2 + 9x + 14$

$7 \times 2 = 14$

$7 + 2 = 9$

$= (x+7)(x+2)$

$4x^2 - 12x + 9$

$-6 \times -6 = 36$

$-6 + -6 = -12$

$= 4x^2 - 6x - 6x + 9$

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

$= (2x-3)^2$

REVIEW: SOLVING QUADRATIC EQUATIONS

Solve the following equations which are already factored.

$(x+7)(x+2) = 0$

$x+7=0$ $\quad$ $x+2=0$

$x=-7$ $\quad$ $x=-2$

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

$3x-5=0$ $\quad$ $2x+3=0$

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

Solve the following equations by converting to factored form.

$x^2 + 5x + 6$

$3 \times 2 = 6$

$3 + 2 = 5$

$= (x+3)(x+2)$

$x+3=0$ $\quad$ $x+2=0$

$x=-3$ $\quad$ $x=-2$

$4x^2 - 12x = -9$

$4x^2 - 12x + 9 = 0$

$(2x-3)^2 = 0$

$2x-3=0$

$x=\frac{3}{2}$

REVIEW: SKETCHING

Graph the following equation using the x-intercepts and vertex.

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

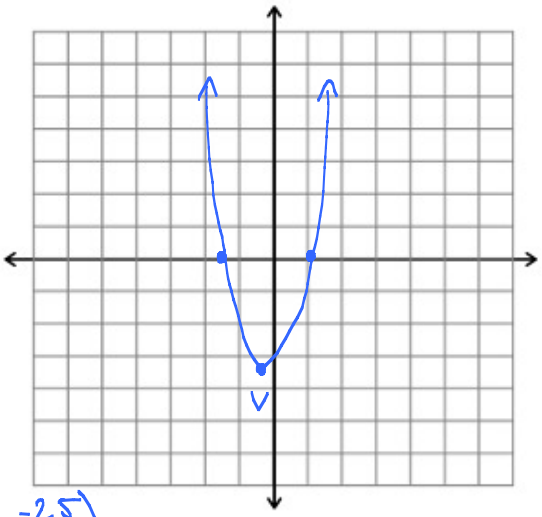
$2x + 3 = 0$ $\quad x - 1 = 0$

$x = \frac{-3}{2}$ $\quad x = 1$

$h = \frac{r + s}{2} = -\frac{1}{4}$

$K = \left(2\left(-\frac{1}{4}\right) + 3\right)\left(-\frac{1}{4} - 1\right) = \left(\frac{5}{2}\right)\left(-\frac{5}{4}\right) = -\frac{25}{8}$

$V\left(-\frac{1}{4}, -\frac{25}{8}\right)$



USE FACTORING TO GRAPH A QUADRATIC EQUATION

Graph the following using the x-intercepts.

$$y = -x^2 + 5x - 6$$

$= -(x^2 - 5x + 6)$

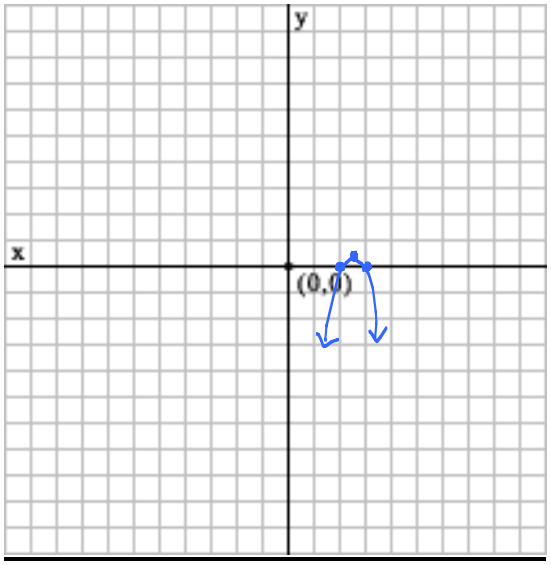
$= -(x - 3)(x - 2)$

$x - 3 = 0$ $\quad x - 2 = 0$

$x = 3$ $\quad x = 2$

$h = \frac{r + s}{2} = \frac{5}{2}$

$K = -\left(\frac{5}{2} - 3\right)\left(\frac{5}{2} - 2\right) = -\left(-\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{4}$



$$y = 2x^2 - x - 6$$

$\frac{-4}{} \times \frac{3}{} = -12$ $\quad \frac{-4}{} + \frac{3}{} = -1$

$= 2x^2 - 4x + 3x - 6$

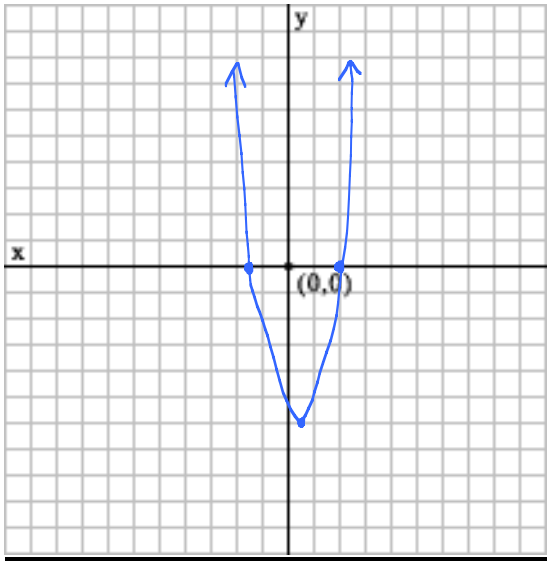
$= 2x(x - 2) + 3(x - 2)$

$= (x - 2)(2x + 3)$

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

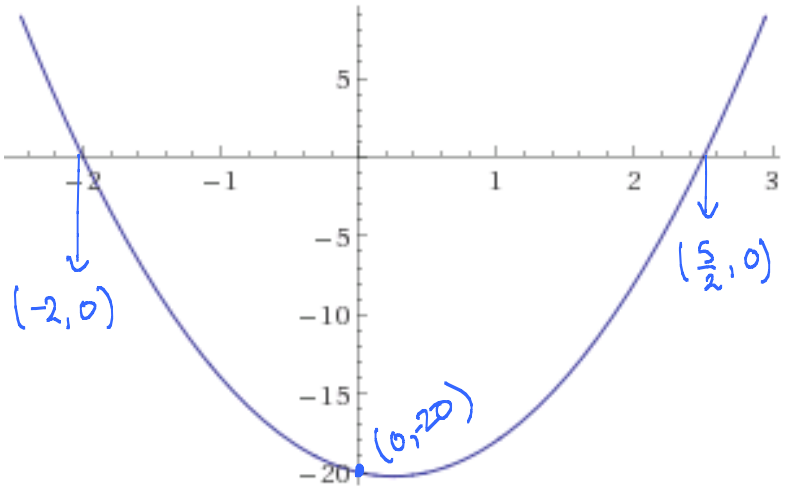
$h = \frac{1}{4}$

$K = -\frac{49}{8} \approx -6.1$



USE THE GRAPH TO FIND THE EQUATION

Using the x-intercepts and vertex, find the factored and standard form of the quadratic equation shown on the graph. (Use only fractions – no decimals!)



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

$= a\left(x-\frac{5}{2}\right)(x+2)$

$= a(2x-5)(x+2)$

Use $P(0,-20)$ to find a

$-20 = a(2(0)-5)(0+2)$

$a = 2$

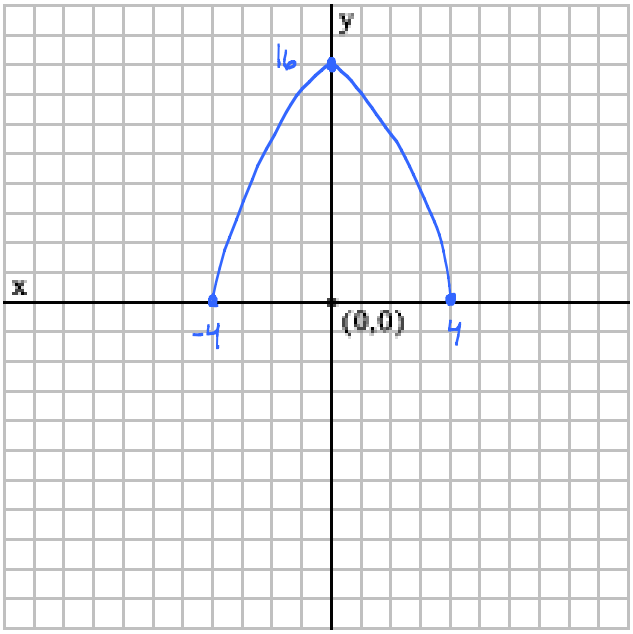
$\boxed{y = 2(2x-5)(x+2)}$

$y = 2(2x^2+4x-5x-10)$

$\boxed{y = 4x^2-2x-20}$

APPLYING TO WORD PROBLEMS

1. To commemorate the 100th anniversary of the Newtonville Fair, an entrance arch will be built. The design engineer uses the equation $h = -d^2 + 16$ to model the arch, where h is the height, in meters, above the ground and d is the horizontal distance, in meters, from the centre of the arch.



   a. How wide and how tall is the arch?

$0 = -d^2 + 16$

$\sqrt{d^2} = \sqrt{16}$

$d = \pm 4$ $V(0,16)$

8m wide and 16m tall.

   b. For what values of d and h is the relation valid? Explain.

d is valid between -4 and 4 → sides of the arch

h is valid between 0 and 16 → top and bottom.

   c. If a width of 2.5 m is needed per line-up at the entrance, how many line-ups can there be?

$\frac{8\text{m wide}}{2.5\text{m wide/line}} \approx 3$ lines

HOMEFUN ☺

P288 Q1-7(every other), 10-16, 19, 20