

05 Quadratic Inequalities - Word Problems

Wednesday, November 28, 2018 8:11 AM

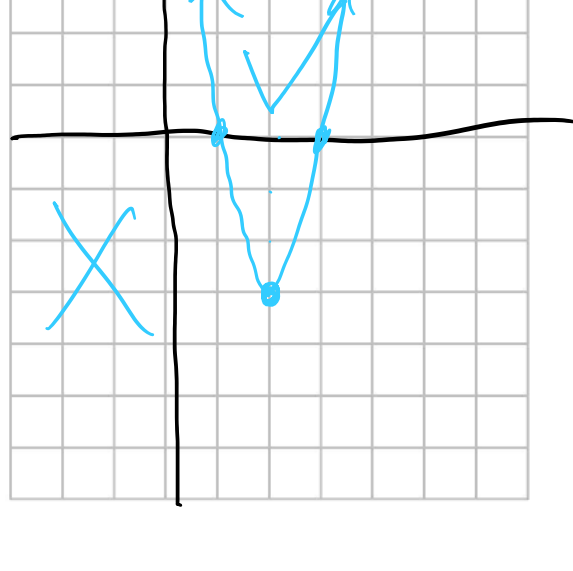


05
Quadrati...

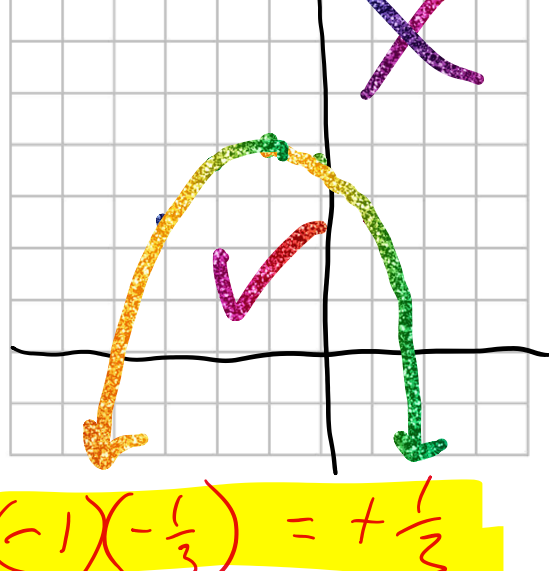
Everyone Loves Word Problems!

Let's start by solving some quadratic inequalities:

$$\begin{aligned} \rightarrow y &\geq 3x^2 - 12x + 9 \\ &3(x^2 - 4x) + 9 \\ &3(x-2)^2 - 12 + 9 \\ &3(x-2)^2 - 3 \\ \text{test}(0,0) \\ 0 &\geq 0 - 0 + 9 \\ &\text{False} \end{aligned}$$

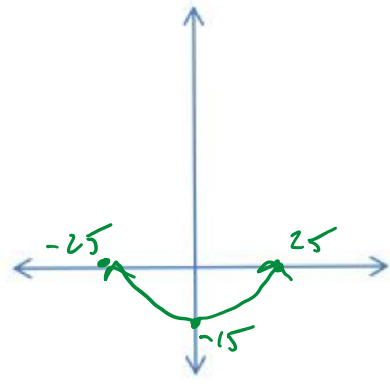


$$\begin{aligned} y &< -\frac{x^2}{3} - \frac{2x}{3} + \frac{11}{3} \\ &-\frac{1}{3}(x^2 + 2x) + \frac{11}{3} \\ &-\frac{1}{3}(x+1)^2 + \frac{1}{3} + \frac{11}{3} \\ &-\frac{1}{3}(x+1)^2 + \frac{12}{3} \\ &-\frac{1}{3}(x+1)^2 + 4 \\ \text{test}(0,0) \quad 0 &< 0 - 0 + \frac{11}{3} \\ &\text{TRUE} \end{aligned}$$



You can use a parabolic reflector to focus sound, light, or radio waves to a single point. A parabolic microphone has a parabolic reflector attached that directs incoming sounds to the microphone. A reporter on the sidelines of a BC Lion game points the microphone at the field to pick up the game sounds. If the microphone has a depth of 15 cm and a width of 50 cm, what is the region that the microphone can pick up?

Graphically:



Algebraically:

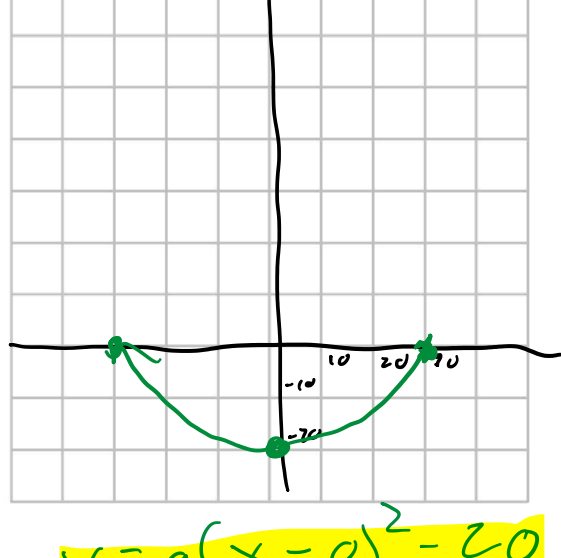
$$\begin{aligned} y &= a(x-p)^2 + q \\ y &= a(x)^2 - 15 \\ \text{Point}(25,0) \\ 0 &= a(25)^2 - 15 \\ \frac{15}{25^2} &= a \\ \frac{3}{125} &= a \\ y &\square \frac{3}{125}x^2 - 15 \\ 0 &\square 0 - 15 \end{aligned}$$

$$y \geq \frac{3x^2}{125} - 15$$

A satellite dish is 60 cm in diameter and 20 cm deep. The dish has a parabolic cross-section.

- Sketch the parabola that represents this dish.
- Determine the inequality that this represents.

$$\begin{aligned} y &= ax^2 - 20 \quad \text{point}(30,0) \\ 0 &= a(30)^2 - 20 \\ \frac{1}{45} &= a \\ y &\square \frac{1}{45}x^2 - 20 \\ 0 &\square 0 - 20 \\ y &> \frac{1}{45}x^2 - 20 \end{aligned}$$

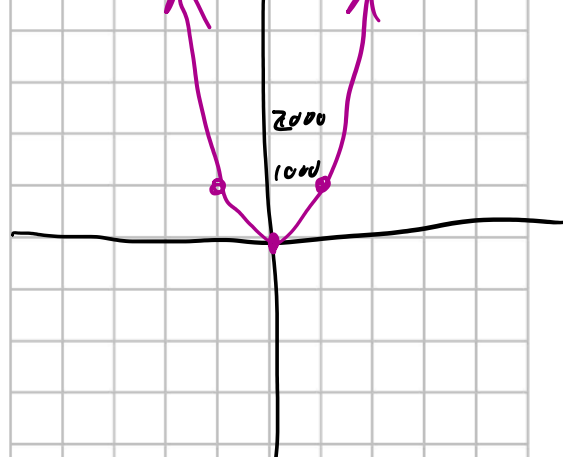


$$y = a(x-p)^2 - 20$$

Sports climbers use synthetic ropes to assure belays or rappels. A rope can safely support a mass, m , in kg, modelled by the inequality $m \leq 980d^2$ where d , is the diameter of the rope in cm.

- Graph the inequality
- What mass can an 8 mm diameter rope support?
- What mass can a 10.4 mm diameter rope support?
- What diameter rope would be needed to support a 3.5 ton whale?

$$\begin{aligned} \text{b) } m &\leq 980(.8)^2 \\ m &\leq 627.2 \text{ kg} \\ \text{c) } m &\leq 980(1.04)^2 \\ m &\leq 1059 \text{ kg} \\ \text{d) } 1.89 &\leq d \end{aligned}$$



HW 9.3

9-13, 16