Combining Functions

Suppose Bob works at a clothing store and makes $8 an hour. Create an equation *f(x)* that represents his earnings.

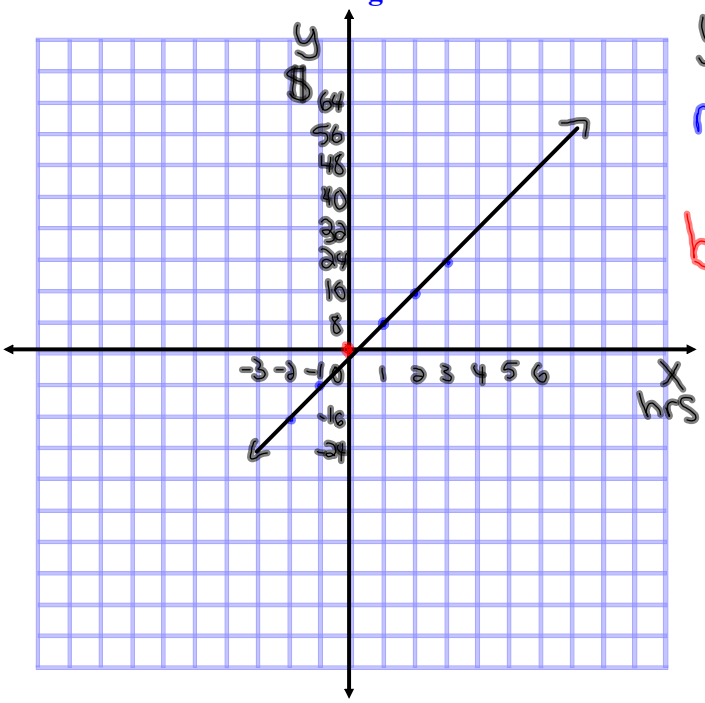
- **Graph this equation below**
- **State the domain and range.**

$f(x) = 8x$

$y = 8x$

$m = \frac{\text{rise}}{\text{run}} = \frac{8}{1}$

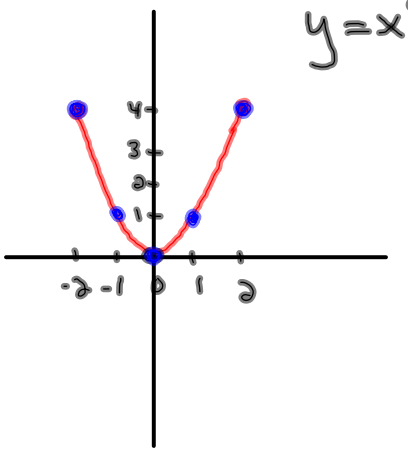
$b = y\text{-int} = 0$



Domain: $\{x \mid x \in R\}$

Range: $\{y \mid y \in R\}$

$y = x^2$

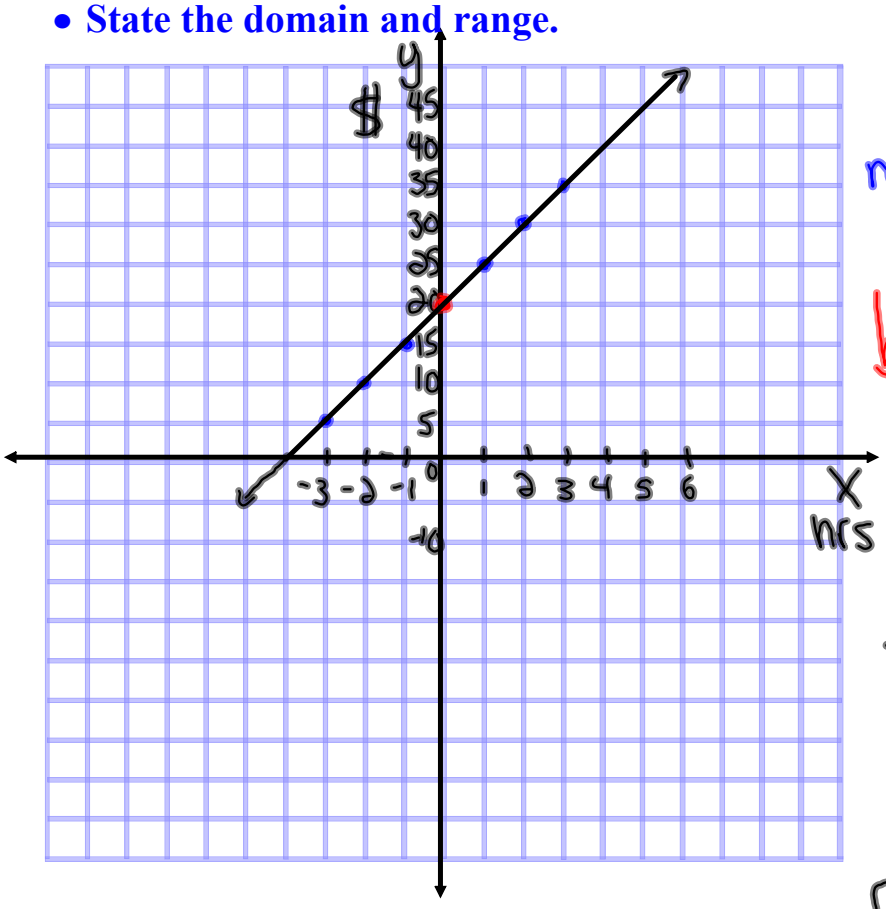


Domain: $\{x \mid -2 \le x \le 2, x \in R\}$

Range: $\{y \mid y \ge 0, y \in R\}$

Now let's suppose that Bob also has a job at the video store where he is paid a flat rate of $20 a shift, plus an additional $5 an hour. Create an equation *g(x)*, that represents his earnings at the video store.

- **Graph the function below**
- **State the domain and range.**



$g(x) = 5x + 20$

$y = 5x + 20$

$m = \frac{\text{rise}}{\text{run}} = 5$

$b = y\text{-int} = 20$

Domain:

$\{x \mid x \in R\}$

Range:

$\{y \mid y \in R\}$

Combining Functions

What do you suppose would happen if we added *g(x)* to *f(x)*? Let's call this *h(x)*

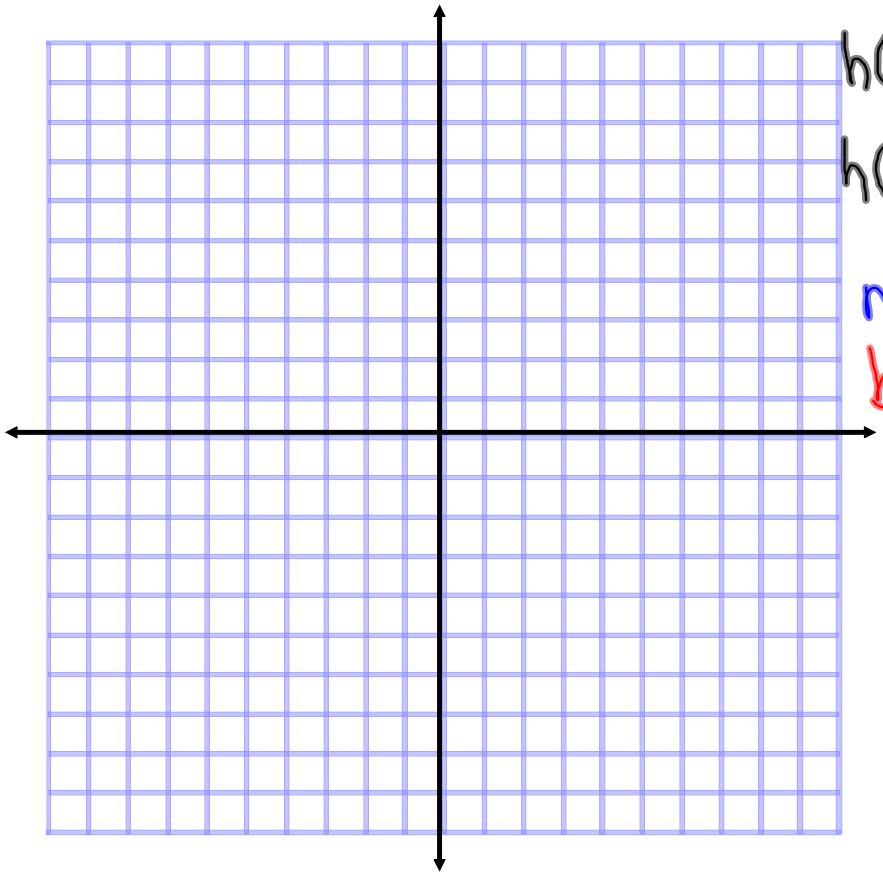
$h(x) = f(x) + g(x)$

$h(x) = 8x + (5x + 20)$

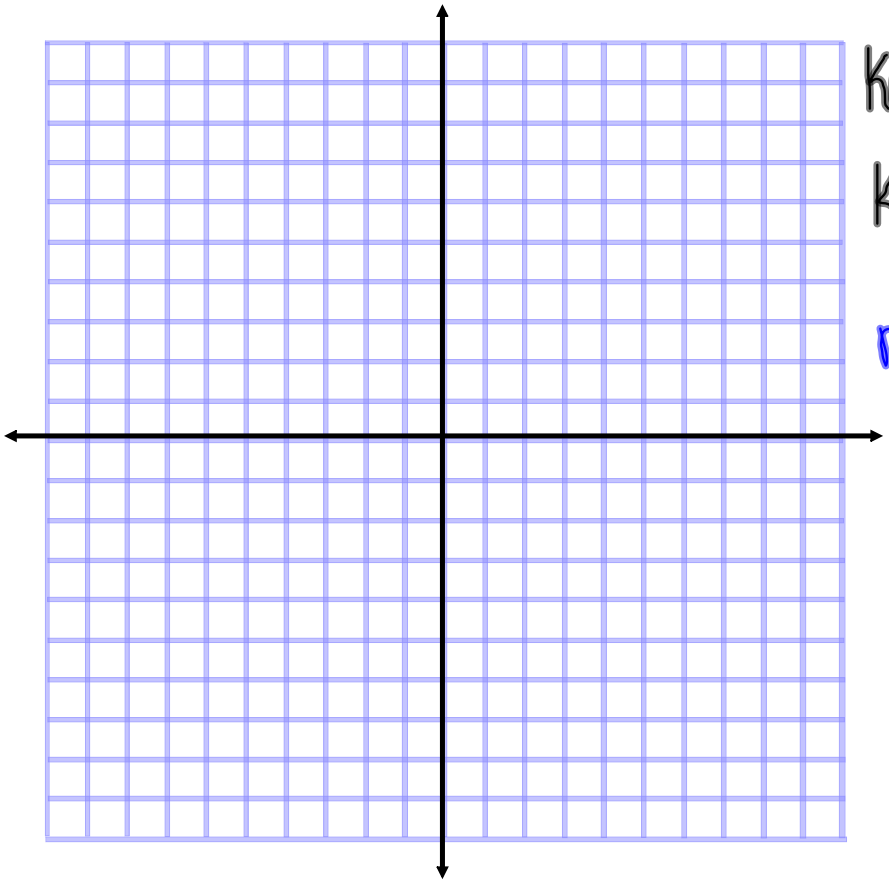
$h(x) = 13x + 20$

$m = 13$

$b = 20$



What do you suppose would happen if we subtracted *g(x) from f(x)?* Let's call this *k(x)*



$k(x) = f(x) - g(x)$

$k(x) = 8x - (5x + 20)$

$k(x) = 3x - 20$

$m = 3$

$b = -20$

What do you suppose would happen if we multiplied *f(x) and g(x)*?

- **What would this graph look like?** → parabola (quadratic)
- **Which way would it open?** up
- **Where would the vertex be?** (-2, -160)

$$f(x) = 8x \qquad g(x) = 5x + 20$$

$y = 8x(5x + 20)$

$y = 40x^2 + 160x$ → General form

Completing the square

$\frac{4}{2} = (2)^2 = 4$

$y = 40(x^2 + 4x)$

$y + 160 = 40(x^2 + 4x + 4)$

$y + 160 = 40(x + 2)^2$

$y = 40(x + 2)^2 - 160$ → Standard form

Vertex: (-2, -160)

HOMEWORK

③ a) $y = x^2 - 5x - 14$

$\left(\frac{-5}{2}\right)^2 = \frac{25}{4}$

$y + 14 = x^2 - 5x$

$y + \frac{14}{1} + \frac{25}{4} = \left(x^2 - 5x + \frac{25}{4}\right)$

$y + \frac{56}{4} + \frac{25}{4} = (x - 5/2)^2$

$y + \frac{81}{4} = (x - 5/2)^2$

$\boxed{y = (x - 5/2)^2 - 81/4}$

Vertex: $(5/2, -81/4)$