



Deriving $y = mx$ (page 1)

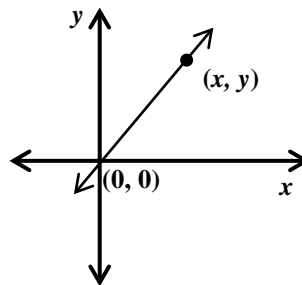
We know that the graphs for direct variation always go through the origin (0, 0). Knowing that, let's derive the equation for direct variation.

$$\frac{y_2 - y_1}{x_2 - x_1} = m \quad \text{slope formula}$$

$$\frac{y - 0}{x - 0} = m \quad (x_1, y_1) = (0, 0) \text{ and } (x_2, y_2) = (x, y)$$

$$\frac{y}{x} = m \quad \text{simplify}$$

$$y = mx \quad \text{Multiplication Property of Equality}$$

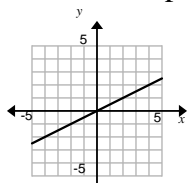


So, in a **direct variation equation**, $y = mx$, the m represents the constant of proportionality (variation), the slope and the unit rate.

Example: Which functions show a proportional relationship? How do you know?

x	0	1	2
y	0	3	6

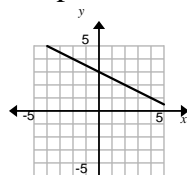
Yes, passes through (0,0)



Yes, passes through (0,0)

$$y = -2x$$

Yes, $y=mx$



No, does not pass through (0,0)

$$y = 2x - 3$$

No, not $y=mx$

x	3	6	9
y	1	2	3

Yes, does pass through (0,0)



Deriving $y = mx$ (page 1)

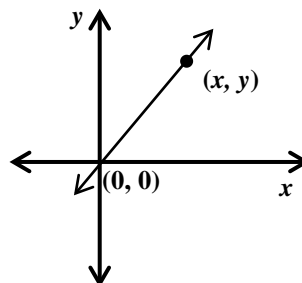
We know that the graphs for direct variation always go through the origin (0, 0). Knowing that, let's derive the equation for direct variation.

$$\frac{y_2 - y_1}{x_2 - x_1} = m \quad \text{slope formula}$$

$$\frac{y - 0}{x - 0} = m \quad (x_1, y_1) = (0, 0) \text{ and } (x_2, y_2) = (x, y)$$

$$\frac{y}{x} = m \quad \text{simplify}$$

$$y = mx \quad \text{Multiplication Property of Equality}$$

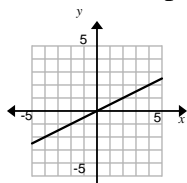


So, in a **direct variation equation**, $y = mx$, the m represents the constant of proportionality (variation), the slope and the unit rate.

Example: Which functions show a proportional relationship? How do you know?

x	0	1	2
y	0	3	6

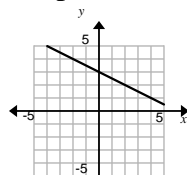
Yes, passes through (0,0)



Yes, passes through (0,0)

$$y = -2x$$

Yes, $y=mx$



No, does not pass through (0,0)

$$y = 2x - 3$$

No, not $y=mx$

x	3	6	9
y	1	2	3

Yes, does pass through (0,0)

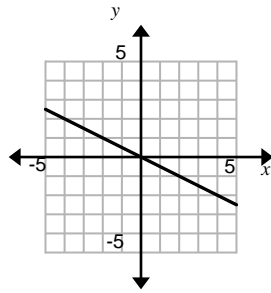
Deriving $y = mx$ (page 2)

Which functions show a proportional relationship? How do you know?

1.

x	0	1	2
y	0	4	8

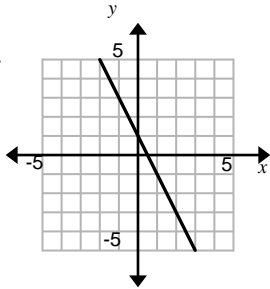
2.



3.

x	-2	-1	0
y	0	3	6

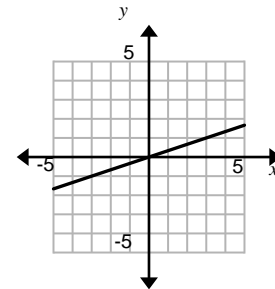
4.



5.

$$y = 2x + 1$$

6.



7.

$$y = x$$

8.

x	2	4	6
y	4	8	12

9.

$$y = -\frac{1}{3}x$$

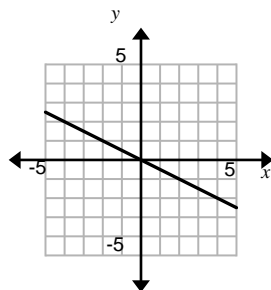
Deriving $y = mx$ (page 2)

Which functions show a proportional relationship? How do you know?

1.

x	0	1	2
y	0	4	8

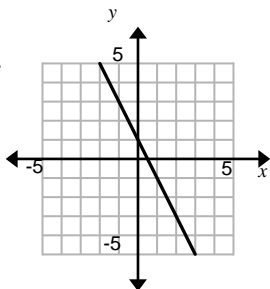
2.



3.

x	-2	-1	0
y	0	3	6

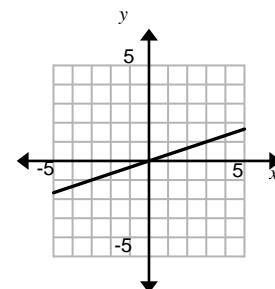
4.



5.

$$y = 2x + 1$$

6.



7.

$$y = x$$

8.

x	2	4	6
y	4	8	12

9.

$$y = -\frac{1}{3}x$$