

1.3 – Linear Functions

The most basic polynomial function, its points form a line.

Most useful form for quick graphing

Slope intercept form: $y = mx + b$ where $m = \text{slope}$ $b = \text{y-intercept}$

Function notation form: $f(x) = ax + b$ Graphing calculator use this form

Standard form: $Ax + By + C = 0$ Useful to graph by intercepts

Point slope form: $m(x - x_a) = (y - y_a)$ with point (x_a, y_a)

Slope formula: $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ better known as $\text{slope} = \frac{\text{rise}}{\text{run}}$

Slope is a very important concept in that it gives the **rate** at which a function changes

Rate of change tells one how the function increases or decreases with respect to x. Basically, it is just a real life way to think about slope.

Ex. If paid at a rate of 8 dollars an hour then function increase by 8 for every x
Pay = $8x$ (hours) or pay as a function of hours $p(h) = 8h$

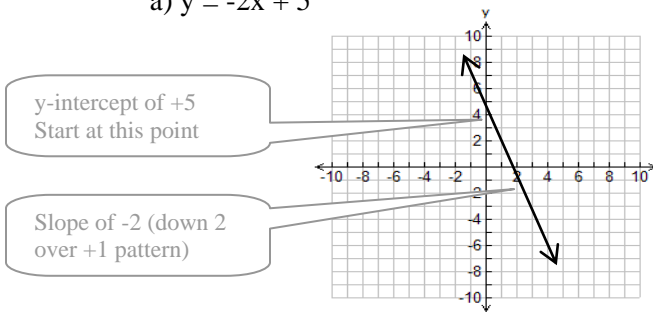
Ex. A hot air balloon descends from 1000m at a rate of 50m every 4 seconds.
Height = $1000 - 50/4$ (seconds) or $h(t) = -12.5t + 1000$

Ex. A car travels at a rate of 100km/h
Distance as a function of time $d(t) = 100t$

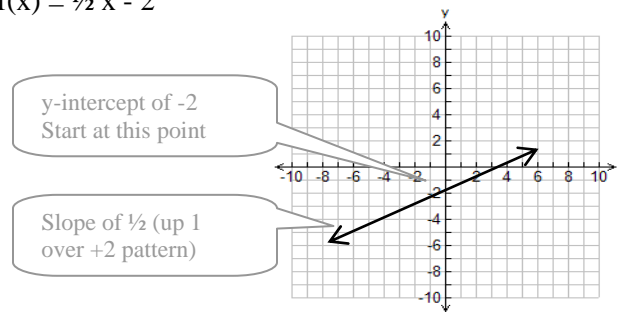
What does this mean as a function? How is slope related to the rate of change?

Example 1: Use slope intercept technique to graph the following linear relations;

a) $y = -2x + 5$

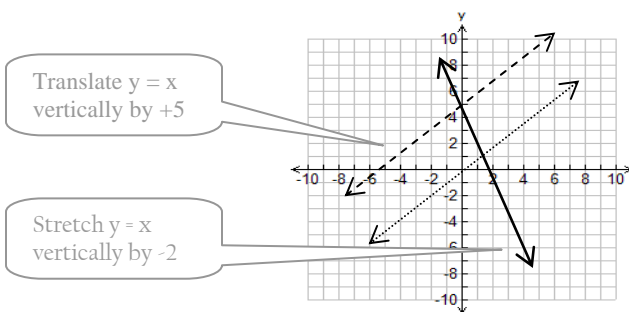


b) $f(x) = \frac{1}{2}x - 2$

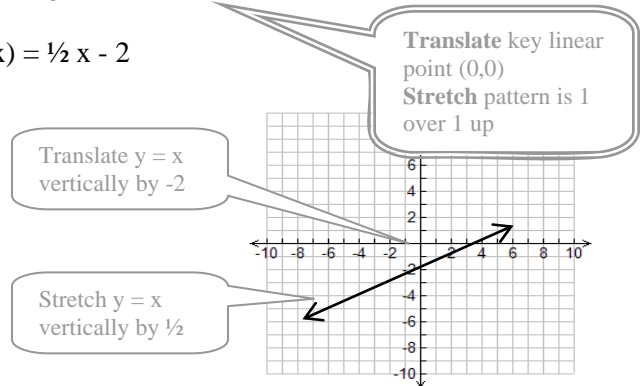


Example 2: Use transformations to graph the following linear relations;

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



b) $f(x) = \frac{1}{2}x - 2$



1.3 – Linear Functions Practice Questions

1. Graph the following using the method of your choice.

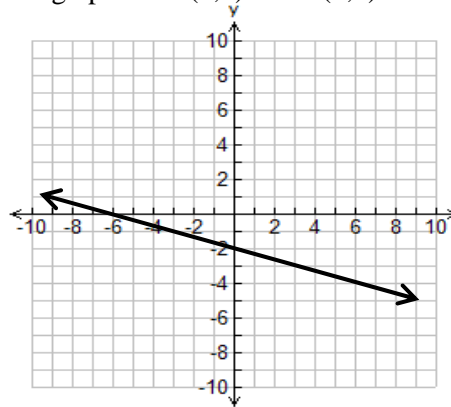
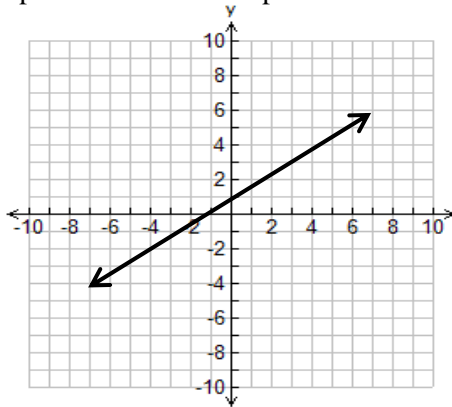
- | | | |
|---------------------|---------------------------------|-------------------------------|
| a) $f(x) = 2x - 1$ | b) $g(x) = \frac{2}{3}x + 1$ | c) $h(x) = -\frac{3}{5}x + 3$ |
| d) $y = -2x$ | e) $y = 15x - 30$ | f) $f(x) = 4$ |
| g) $f(x) = 4x - 50$ | h) $g(x) = \frac{-30x}{4} + 20$ | i) $x = -2$ |

2. Find the slope given:

- | | |
|------------------------------------|-------------------------------------|
| a) $f(x) = 2x + 1$ | b) $g(x) = -\frac{2}{3}x - 3$ |
| c) points on line A(2,3) & B(-3,5) | d) points on line C(-3,4) & D(4,-5) |

3. Find equation of lines given:

- | | |
|------------------------------------|--|
| a) slope = 3 and y-intercept of -3 | b) slope of $-\frac{1}{2}$ and point (3, -2) |
| c) slope of 4 and x-intercept of 4 | d) through points A(2,5) and B(6,1) |
| e) | f) |



4. What is the effect of changing the slope from 2 to 3 in a linear function?
5. What is the effect of changing the y-intercept from 30 to 40 in a linear function?
6. A submarine cruising at 30m below the surface starts to dive at a rate of 2 metres every 5 seconds.
- Come up with an function to describe the submarine's depth as a function of time.
 - Use your function to calculate the submarine's depth after 2 minutes.
 - How long will it take the submarine to reach a depth of 138m?

Answers 2. a) $m=2$ b) $m = \frac{2}{3}$ c) $m = -\frac{2}{5}$ d) $m = -\frac{9}{7}$ 3. a) $y=3x-3$ b) $0=x-2y+1$ c) $y=4x-16$ d) $x+y-7=0$

e) $y = \frac{2}{3}x + 1$ f) $x+3y+6 = 0$ 4. line gets steeper, y-intercept stays the same. 5. line moves up parallel to

original (i.e. same slope) 6.a) $d(t) = -\frac{2}{5}t - 30$ b) $d=-78m$ c) $t=270s$ or $4\frac{1}{2}$ minutes

1.3 - Sketching Practice Sheet

