Math 1 - Summer 2020 - June 30

Important Concepts

- Linear equations
- Transformation of functions
- Identifying where a function is **increasing** / **decreasing** from a graph
- Identifying where a function is **concave up** / **concave down** from a graph
- Inverse Functions

Example 1. Which of the following tables could represent a linear function? For each that could be linear, find a linear equation that models the data.

Slope: $\frac{y_2 - y_1}{x_2 - x_1}$

↓ x values, ↓ y values

$g(x)$ linear

x	$g(x)$	
0	6	$\frac{-19-6}{2-0} = \frac{-25}{2}$
2	-19	$\frac{-44+19}{4-2} = \frac{-25}{2}$
4	-44	$\frac{-69+44}{6-4} = \frac{-25}{2}$
6	-69	

$h(x)$ linear

x	$h(x)$	
2	13	$\frac{23-13}{4-2} = \frac{10}{2} = 5$
4	23	$\frac{43-23}{8-4} = \frac{20}{4} = 5$
8	43	$\frac{53-43}{10-8} = \frac{10}{2} = 5$
10	53	

Try these on your own

linear

x	$f(x)$	
2	-4	$\frac{16+4}{4-2} = \frac{20}{2} = 10$
4	16	$\frac{36-16}{6-4} = \frac{20}{2} = 10$
6	36	$\frac{56-36}{8-6} = \frac{20}{2} = 10$
8	56	

not linear

x	$k(x)$	
0	6	$\frac{31-6}{2-0} = \frac{25}{2}$ not the same
2	31	$\frac{106-31}{6-2} = \frac{75}{4}$
6	106	
8	231	

Example 1. Which of the following tables could represent a linear function? For each that could be linear, find a linear equation that models the data.

$y = mx + b$

$y - y_1 = m(x - x_1)$

x	$g(x)$
0	6
2	-19
4	-44
6	-69

$m = \frac{-25}{2}$

$y - 6 = \frac{-25}{2}(x - 0)$

$y - 6 = \frac{-25}{2}x$

$y = \frac{-25}{2}x + 6$

$g(x) = \frac{-25}{2}x + 6$

x	$f(x)$
2	-4
4	16
6	36
8	56

$m = 10$

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

$y + 4 = 10x - 20$

$y = 10x - 24$

$f(x) = 10x - 24$

x	$h(x)$
2	13
4	23
8	43
10	53

$m = 5$

$y - 13 = 5(x - 2)$

$y - 13 = 5x - 10$

$y = 5x + 3$

$h(x) = 5x + 3$

Find $h(x)$ and $f(x)$

x	$k(x)$
0	6
2	31
6	106
8	231

Example 2. Match each graph with the corresponding line.

(a) $y = 2$ horizontal line (A) Try on your own for a couple minutes

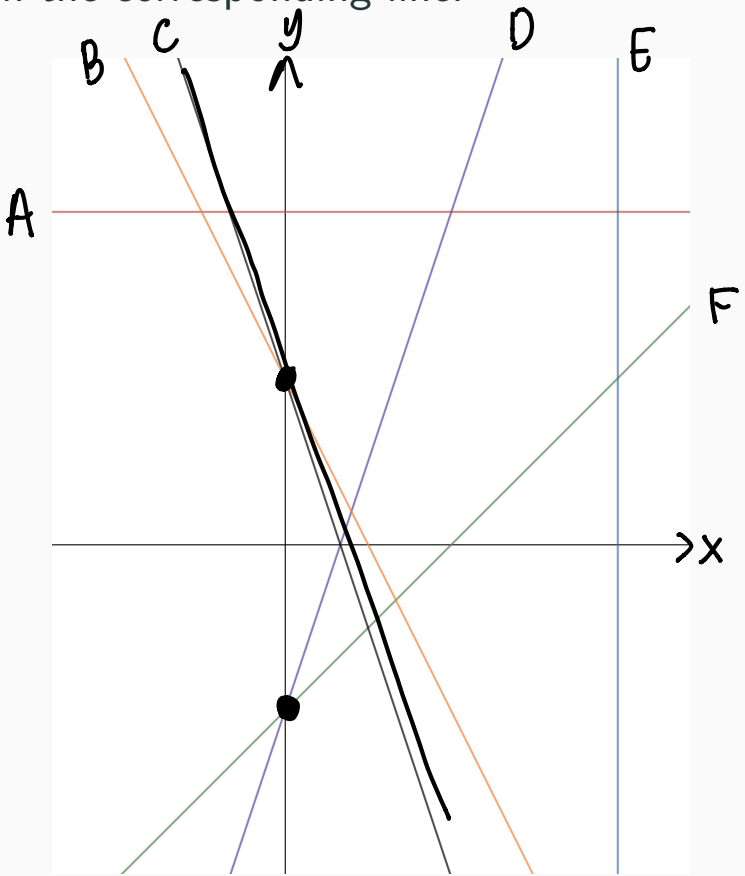
(b) $x = 2$ vertical line (E)

(c) $y = x - 1$ (F)

(d) $y = 3x - 1$ (D)

(e) $y = 1 - 3x$ (C)

(f) $y = 1 - 2x$ (B)



Example 3. Match each graph with the corresponding equation.

(a) $f(x) = \sqrt{x}$ (D)

Try on your own for a couple minutes

(b) $g(x) = \sqrt{-x}$ (A)

horizontal reflection

(c) $h(x) = -\sqrt{x}$ (E)

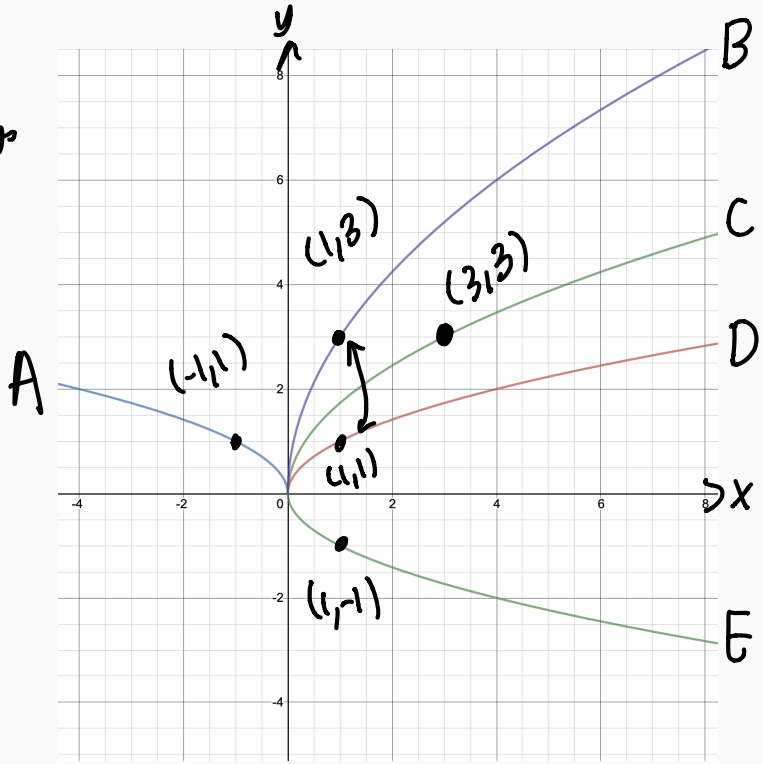
vertical reflection

(d) $j(x) = \sqrt{3x}$ (C)

horizontal compression by 3

(e) $k(x) = 3\sqrt{x}$ (B)

vertical stretch by 3



Example 4. Match each graph with the corresponding equation.

(a) $f(x) = |x|$ (C)

(b) $g(x) = |x - 2|$ (D)

right 2

(c) $h(x) = |x + 2|$ (B)

left 2

(d) $j(x) = |x| + 3$ (E)

up 3

(e) $k(x) = |x| - 3$ (A)

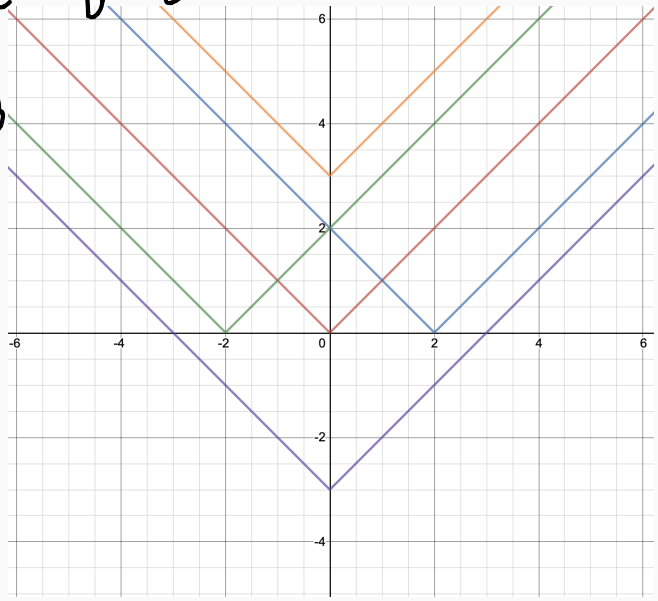
down 3

Try this in your own for a couple minutes

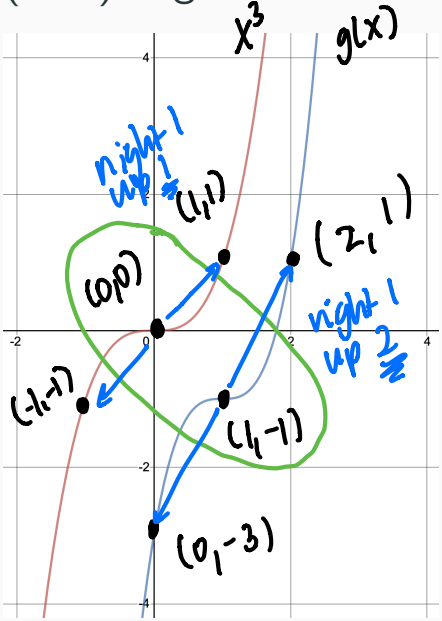
C D E

B

A



Example 5. The graph of $f(x) = \sqrt[3]{x}$ (red) and a transformation $g(x)$ (blue) is given in the image below. Find the equation of $g(x)$.



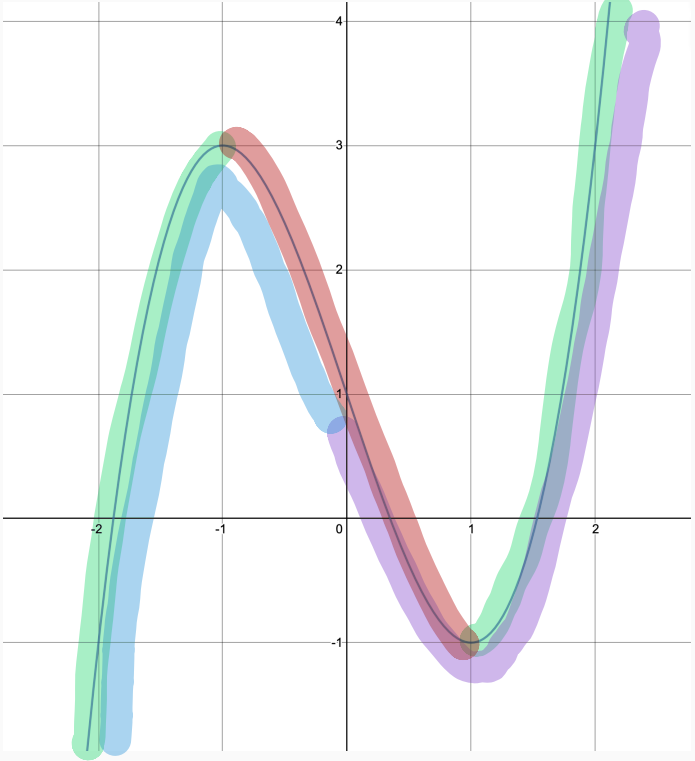
right 1 unit

down 1 unit

vertical stretch by 2 units

$$g(x) = 2(x-1)^3 - 1$$

Example 6. The graph of a function is given below. Where is the function increasing? Where is the function decreasing? Where is the function concave up? Where is the function concave down? Use interval notation.



always use (,)

increasing: $(-\infty, -1) \cup (1, \infty)$
(positive "slope")

decreasing: $(-1, 1)$

concave up: $(0, \infty)$
$\cup$

concave down: $(-\infty, 0)$
$\cap$

Example 7. Let $f(x) = \dfrac{x+2}{2x+3}$.

(a) What is $f(0)$?

(b) What is $(f(0))^{-1}$?

(c) Without finding $f^{-1}(x)$, what is $f^{-1}\left(\frac{2}{3}\right)$?

Example 8. Let $f(x) = \dfrac{x+2}{2x+3}$. Find $f^{-1}(x)$.