

Chapter 1 Review

White Board Action!

have fun
reviewing!!

Linear Equation

- Write the equation, of the linear function f such that it has the indicated function values

$$f(2) = -6$$

$$f(-1) = 3$$

$$\text{slope} = \frac{-6-3}{2-(-1)} = \frac{-9}{3} = -3$$

$$y = -3x + b$$

$$3 = -3(-1) + b$$

$$3 = 3 + b \rightarrow b = 0$$

$$y = -3x$$

Distance and Midpoint

- Find the distance between these two points, and then find the midpoint

$$f(2) = -6$$

$$f(-1) = 3$$

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$d = \sqrt{(2 - (-1))^2 + (-6 - 3)^2}$$

$$= \sqrt{9 + 81}$$

$$= \sqrt{90}$$

$$= \sqrt{9 \cdot 10}$$

$$d = 3\sqrt{10}$$

Greatest Integer Function

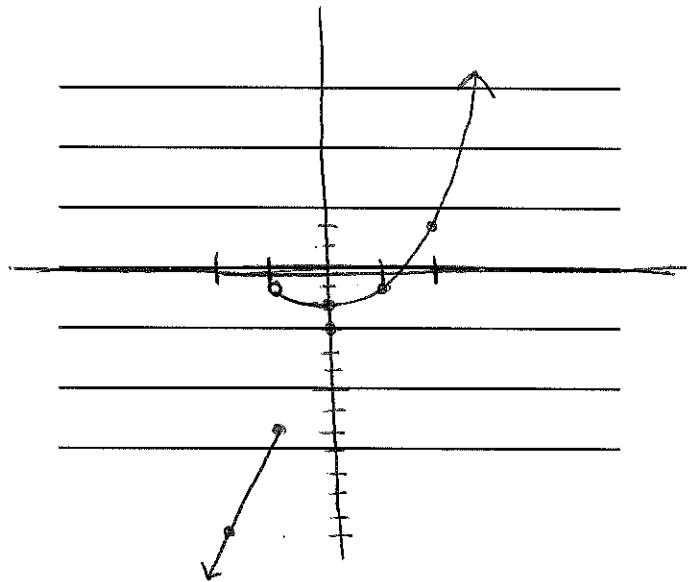
- For the function $f(x) = \lceil -0.3x + 5 \rceil - 1.2$
find $f(3)$

$$\begin{aligned} f(3) &= \lceil -0.3(3) + 5 \rceil - 1.2 \\ &= \lceil -0.9 + 5 \rceil - 1.2 \\ &= \lceil 4.1 \rceil - 1.2 \\ &= 4 - 1.2 \\ f(3) &= 2.8 \end{aligned}$$

Piecewise Function

- Graph the piecewise function
(use some exact points):

$$f(x) = \begin{cases} 5x - 3 & x \leq -1 \\ x^2 - 2 & x > -1 \end{cases}$$



Symmetry and Even/Odd

- Is the following function even, odd or neither?
- What type of symmetry does it have?

$$f(x) = \frac{x^2}{x^4 + 3}$$

$$f(-x) = \frac{(-x)^2}{(-x)^4 + 3} = \frac{x^2}{x^4 + 3}$$

SAME as original

EVEN function
Y-AXIS symmetry

Inverses

- Find the inverse function of

$$f(x) = \frac{3x-2}{x+4}$$

- Find the domain of $f(x)$ $\{x \mid x \neq -4\}$

- Find the domain of $f^{-1}(x)$

$$\{x \mid x \neq 3\}$$

$$x = \frac{3y-2}{y+4}$$

$$x(y+4) = 3y-2$$

$$xy + 4x = 3y - 2$$

$$xy - 3y = -2 - 4x$$

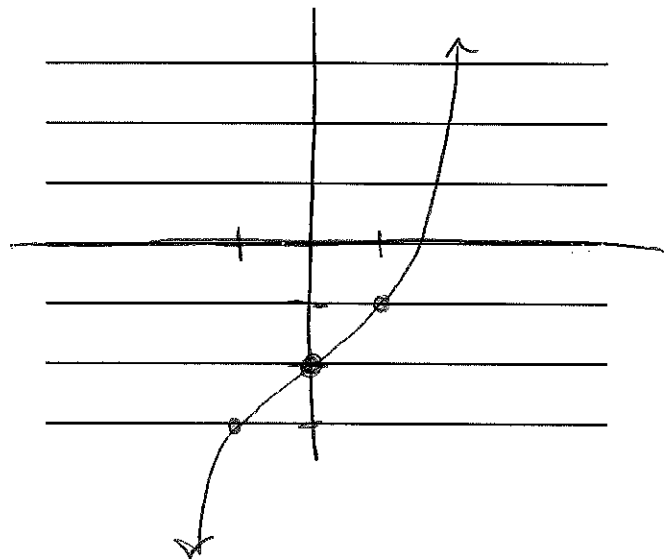
$$y(x-3) = -2-4x$$

$$y = \frac{-2-4x}{x-3} \quad \text{or} \quad \frac{4x+2}{3-x}$$

Transformations- sketching

- Sketch a graph of the function:

$$f(x) = x^3 - 2$$



Transformations- describing

- For the equation,
Identify the parent (mother) function
Describe ALL transformations- be specific

$$f(x) = (x-2)^3 + 2$$

parent: $f(x) = x^3$
Cubic function

shifted right 2

shifted up 2

Intercepts

- For the equation,
 - Find the x-intercept(s)
 - Find the y-intercept

$$f(x) = (x+1)^2 - 9$$

$$x\text{-int: } 0 = (x+1)^2 - 9$$

$$9 = (x+1)^2$$

$$\pm 3 = x+1$$

$$-1 \pm 3 = x$$

$$-4 = x \quad 2 = x \rightarrow \boxed{(-4, 0) \text{ and } (2, 0)}$$

$$y\text{-int: } y = (0+1)^2 - 9$$

$$y = -8 \rightarrow \boxed{(0, -8)}$$

Equation of a Circle

- Find the equation of the circle with endpoints of a diameter that are

$$(4, -2) \text{ and } (3, 6)$$

for center, use midpoint

$$\left(\frac{4+3}{2}, \frac{-2+6}{2} \right)$$

$$\left(\frac{7}{2}, \frac{4}{2} \right) \rightarrow \left(\frac{7}{2}, 2 \right)$$

$$(x - 7/2)^2 + (y - 2)^2 = r^2$$

$$(3 - 7/2)^2 + (6 - 2)^2 = r^2$$

$$1/4 + 16 = r^2$$

$$\boxed{(x - 7/2)^2 + (y - 2)^2 = 16.25}$$

Translating into an expression

- Write an expression or equation:
X is 5 more than two-thirds of the sum of y and z

$$\boxed{x = 5 + \frac{2}{3}(y + z)}$$

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$$f + g$$

$$\begin{aligned}(f + g)(x) &= f(x) + g(x) \\ &= x^2 + 3 + 2x - 1 \\ &= x^2 + 2x + 2\end{aligned}$$

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$$\frac{f}{g} \quad \text{and name any restrictions}$$

$$\begin{aligned}\left(\frac{f}{g}\right)(x) &= \frac{f(x)}{g(x)} \\ &= \frac{x^2 + 3}{2x - 1}\end{aligned}$$

$x \neq \frac{1}{2}$ ↖
restriction

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$$(f \circ g)(x)$$

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ &= f(2x - 1) \\ &= (2x - 1)^2 + 3 \\ &= 4x^2 - 4x + 1 + 3 \\ &= 4x^2 - 4x + 4\end{aligned}$$

Composition of Functions

Find two functions, $f(x)$ and $g(x)$ such that $f(g(x)) = h(x)$

$$h(x) = \sqrt[3]{x+2}$$

many answers

$$\text{ex: } f(x) = \sqrt[3]{x}$$

$$g(x) = x+2$$

Difference Quotient

For $f(x) = 4x^2 - 3$

find $\frac{f(x+h) - f(x)}{h}$

$$\frac{4(x+h)^2 - 3 - (4x^2 - 3)}{h}$$

$$= \frac{(4(x^2 + 2xh + h^2) - 3 - 4x^2 + 3)}{h}$$

$$= \frac{(4x^2 + 8xh + 4h^2 - 4x^2)}{h}$$

$$= \frac{8xh + 4h^2}{h}$$

$$= \frac{8x + 4h}{1}$$

$$= \boxed{8x + 4h}$$

Average Rate of Change

For $f(x) = 4x^2 - 3x + 2$

find the average rate of change from $x = 0$ to $x = 2$

like slope!

$$f(0) = 2$$

$$f(2) = 4(2)^2 - 3(2) + 2$$

$$f(2) = 12$$

$$\frac{12 - 2}{2 - 0} = \frac{10}{2} = \boxed{5}$$

Symmetry and Even/Odd

- Is the following function even, odd or neither?
- What type of symmetry does it have?

$$xy = 10$$

$$y = \frac{10}{x}$$
$$f(-x) = \frac{10}{-x} = \text{opposite of original}$$

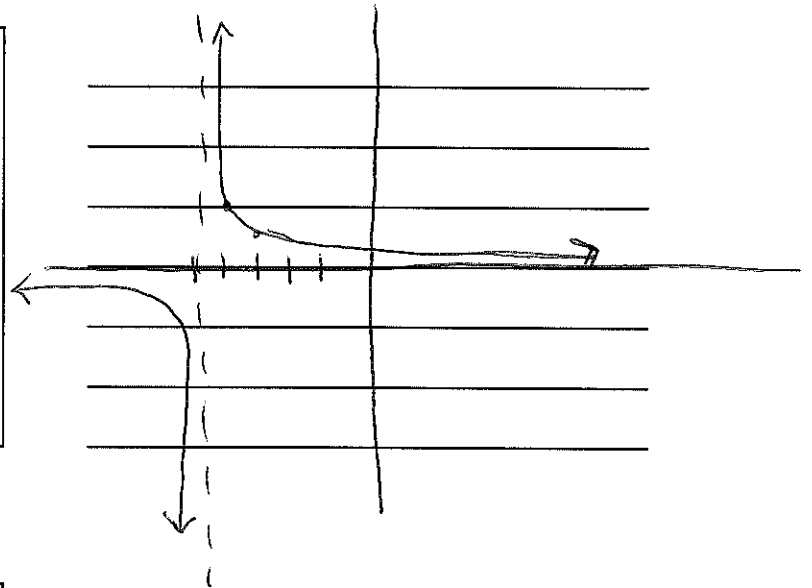
ODD function

ORIGIN symmetry

Transformations- sketching

- Sketch a graph of the function:

$$f(x) = \frac{1}{x+5}$$



Transformations- describing

- For the equation,
Identify the parent (mother) function
Describe ALL transformations- be specific

$$f(x) = \frac{5}{2x} + 9$$

parent: $f(x) = \frac{1}{x}$

reciprocal function

vertical stretch (factor of 5)

horizontal shrink (factor of $\frac{1}{2}$)

shifted up 9

- OR -

vertical stretch (factor of $\frac{5}{2}$)
shifted up 9

Transformations- describing

- For the equation,
 - Identify the parent (mother) function
 - Describe ALL transformations- be specific

$$f(x) = -2|x+4|+6$$

parent: $f(x) = |x|$

absolute value function

shifted left 4

vertically stretched (factor of 2)

reflected over the x-axis

shifted up 6

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$g - f$

$$\begin{aligned}(g - f)(x) &= g(x) - f(x) \\ &= (2x - 1) - (x^2 + 3) \\ &= 2x - 1 - x^2 - 3 \\ &= -x^2 + 2x - 4\end{aligned}$$

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$f \cdot g$

$$\begin{aligned}(f \cdot g)(x) &= f(x) \cdot g(x) \\ &= (x^2 + 3)(2x - 1) \\ &= 2x^3 - x^2 + 6x - 3\end{aligned}$$

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$$(g \circ f)(x)$$

$$\begin{aligned}(g \circ f)(x) &= g(f(x)) \\ &= 2(x^2 + 3) - 1 \\ &= 2x^2 + 6 - 1 \\ &= 2x^2 + 5\end{aligned}$$

Composition of Functions

Use the functions:

$$f(x) = x^2 + 3 \quad g(x) = 2x - 1$$

find

$$(f \circ f)(3)$$

$$f(f(3))$$

$$f(3^2 + 3)$$

$$f(12)$$

$$12^2 + 3$$

$$144 + 3$$

$$147$$

Composition of Functions

Find two functions, $f(x)$ and $g(x)$ such that $f(g(x)) = h(x)$

$$h(x) = (6x - 5)^3$$

many answers

$$\text{ex: } f(x) = x^3$$

$$g(x) = 6x - 5$$