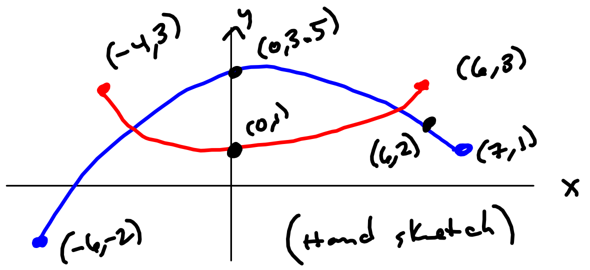


(a) $f(0) = 1$

(b) $g(6) = 2$

(c) $g(4) > f(4)$

$g(4)$ is larger than $f(4)$

(d) $g(6) = 2$

(e) $f(x) < g(x)$ on $(-3, 5)$

(f) g is increasing on $[-6, 1]$

(g) g is decreasing on $[1, 7]$

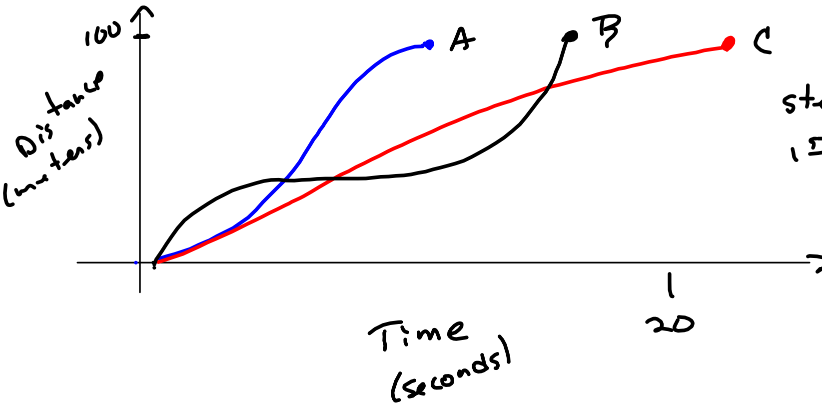
(h) $\mathcal{D}(f) = \text{Domain of } f = \{x \mid f(x) \text{ is defined}\}$

$= [-4, 6] = \mathcal{D}(f)$

$\mathcal{R}(f) = [1, 3.3] = \text{Range of } f = \{y \mid y = f(x) \text{ for some } x \in \mathcal{D}(f)\}$

(i) $\mathcal{D}(g) = [-6, 7]$ & $\mathcal{R}(f) = [-2, 3.8]$. (ish)

(2) The graph describes distance as a function of time.



Runner A ran a steady race, and finished 1st.

Runner B was fastest off the blocks, but must have fallen, b/c he stopped moving for a while, finishing 2nd

Runner C was slow, and finished last, in over 20 seconds.

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

(a) $$\frac{f(2+h)-f(2)}{h} = \frac{(2+h)^2 - 3(2+h) + 2 - (2^2 - 3(2) + 2)}{h}$$

$$= \frac{4 + 4h + h^2 - 6 - 3h + 2 - 4 + 6 - 2}{h}$$

$$= \frac{4h + h^2 - 3h}{h} = \frac{h + h^2}{h} = \underset{(h \neq 0)}{1 + h} \xrightarrow{h \to 0} 1$$

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

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

$$= \underset{(h \neq 0)}{2x + h - 3} \xrightarrow{h \to 0} \boxed{2x - 3 = f'(x)}$$

2410

Mills, Harry

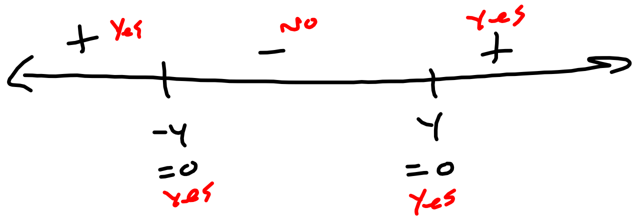
(4) $f(x) = \frac{x-3}{x^3-27} = \frac{x-3}{(x-3)(x^2+3x+9)} = \frac{1}{x^2+3x+9}$ $(x \neq 3)$

$\mathcal{D}(f) = \mathbb{R} \setminus \{3\}$

x^3-27 has root $\sqrt[3]{27} = 3$

(5) $f(x) = \sqrt{x^2-16} \longrightarrow$

$\mathcal{D}(f) = \{x \mid x^2-16 \geq 0\} = \{x \mid (x-4)(x+4) \geq 0\}$



want ≥ 0, i.e., "+" or "= 0"

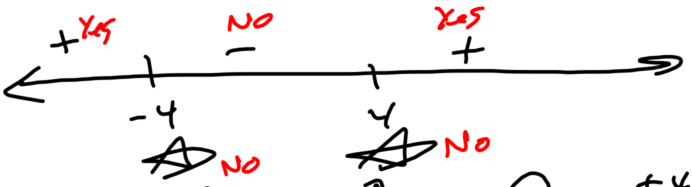
Sign pattern for x^2-16

$\Longrightarrow \mathcal{D}(f) = (-\infty, -4] \cup [4, \infty)$

(6) $g(x) = \frac{1}{\sqrt{x^2-16}} \longrightarrow \mathcal{D}(g)$ is same as $\mathcal{D}(f)$, almost.

Not quite, b/c we also need $x^2-16 \neq 0$, i.e.,

$x^2-16 > 0$:



Blows up @ $x = \pm 4$

$\therefore \boxed{\mathcal{D}(g) = (-\infty, -4) \cup (4, \infty)}$

2410

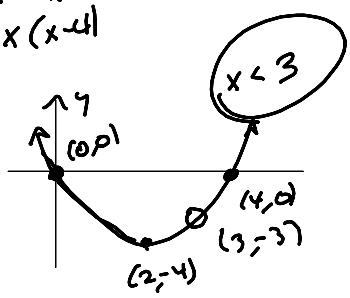
6 we sketch $f(x) = \begin{cases} x^2 - 4x & \text{if } x < 3 \\ -2x+3 & \text{if } x \geq 3 \end{cases}$

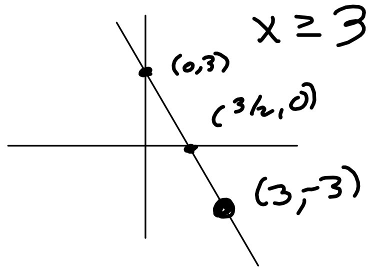
MILLS, HARRY

$x^2 - 4x$
$= x(x-4)$

$y = -2x+3$

x	y
0	3
3/2	0



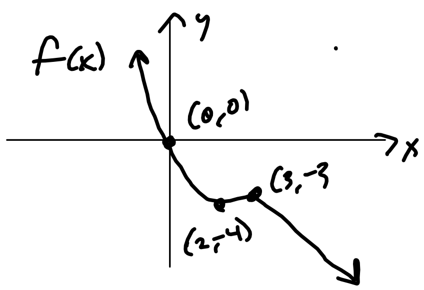


$-2(3)+3 = -3$

$f(2) = 2^2 - 4(2) = 4 - 8 = -4$

$f(3) = 3^2 - 4(3) = 9 - 12 = -3$

cool! they connect @ the suture point $x=3$.!



7 Find a linear equation that models temperature
T (in degrees Fahrenheit, as a function of
n = the # of times a cricket chirps per minute if
$(n_1, T_1) = (115, 72)$ & $(n_2, T_2) = (180, 81)$, i.e.,
115 Chirps/min $\rightsquigarrow 72^\circ$ &
180 Chirps/min $\rightsquigarrow 81^\circ$
Lines are easier w/ x's & y's:
$y = T$
$x = n$
$(x_1, y_1) = (n_1, T_1) = (115, 72)$
$(x_2, y_2) = (n_2, T_2) = (180, 81)$
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{81 - 72}{180 - 115} = \frac{9}{65} = m \longrightarrow$

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

$y = \frac{9}{65}(x - 115) + 72$, i.e.,

$$\boxed{T = \frac{9}{65}(n - 115) + 72}$$

2410 MILLS, ~~HARRY~~

(8) To graph $-3f(-2x-14)+11$ from $f(x)$,
I'd factor out the "-2" inside, and get
$-3f(-2(x+7))+11$ and I would:.
.. Flip vertically and stretch vertically by a factor of -3, i.e., $y \longmapsto -3y$, $(-3f(x))$
Then I'd shrink towards y-axis by a factor of 2 and flip about the y-axis $(-3f(-2x))$. $x \mapsto -\frac{1}{2}x$
Then I'd shift left 7 :: $(-3f(-2(x+7)))$. $x \mapsto x-7$
Finally, I'd move it all up 11 units. $y \mapsto y+11$

2410

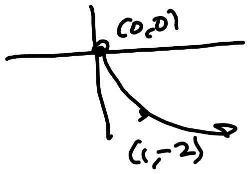
MILLS, HARRY

(9) $g(x) = -2\sqrt{5x-20} + 8 = -2\sqrt{5(x-4)} + 8$

(1) $f(x) = \sqrt{x}$

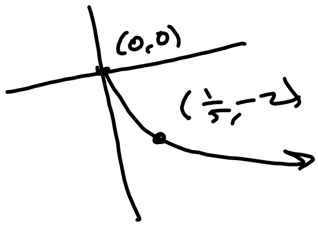
(2) $-2f(x)$

$= -2\sqrt{x}$



(3) $-2f(5x)$

$= -2\sqrt{5x}$

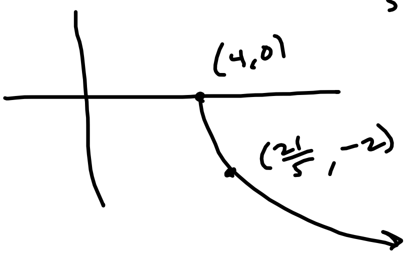


(4) $-2f(5(x-4))$

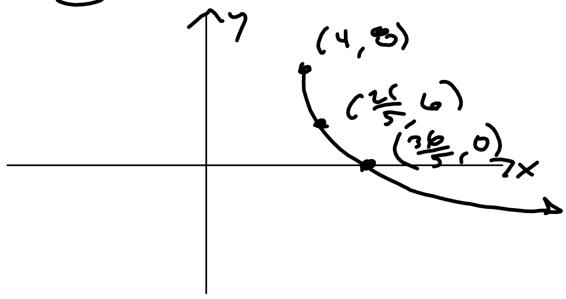
$-2\sqrt{5(x-4)}$

$x \mapsto x+4$

$\frac{1}{5} + 4 = \frac{1+20}{5} = \frac{21}{5}$



(5) $g(x) = -2f(5(x-4)) + 8$



x-int:

$g(x) = 0$

$-2\sqrt{5x-20} + 8 = 0$

$-2\sqrt{5x-20} = -8$

$\sqrt{5x-20} = 4$

$5x - 20 = 4^2 = 16$

$5x = 36$

$x = \frac{36}{5} \rightsquigarrow \left(\frac{36}{5}, 0\right)$

2410

MILLS, HARRY

10 $f(x) = x^2 - 2x - 3$ & $g(x) = 2x^2 - 3x - 5$

a $(f+g)(x) = f(x) + g(x) = x^2 - 2x - 3 + 2x^2 - 3x - 5$

$= \boxed{3x^2 - 5x - 8 = f(x) + g(x)}$ $\boxed{\mathcal{D}(f+g) = \mathbb{R}}$

b $R(x) = \dfrac{f(x)}{g(x)} = \dfrac{x^2 - 2x - 3}{2x^2 - 3x - 5} = \dfrac{(x-3)(x+1)}{(2x-5)(x+1)} = \dfrac{x-3}{2x-5}$ $(x \neq -1)$

$\mathcal{D}(R) = \mathbb{R} \setminus \{\frac{5}{2}, -1\}$ OR $(-\infty, -1) \cup (-1, \frac{5}{2}) \cup (\frac{5}{2}, \infty)$

OR $\{x \mid x \neq \frac{5}{2} \text{ and } x \neq -1\} =$

$= \{x \mid x \neq \frac{5}{2} \text{ or } -1\} = \{x \mid x \notin \{-1, \frac{5}{2}\}\}$

$= \{x \mid x \notin \{-1\} \cup \{\frac{5}{2}\}\}$