If $f(x) = 1 - 2x - x^2$, find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$.

SCORE: _____ / 14 PTS

$$\frac{1 - 2(x+h) - (x+h)^2 - (1 - 2x - x^2)}{h}$$

$$= \frac{\cancel{1} - \cancel{2x} - 2h - \cancel{x^2} - 2xh - h^2 - \cancel{1} + \cancel{2x} + \cancel{x^2}}{h}$$

$$= \frac{-2h - 2xh - h^2}{h}$$

$$= -2 - 2x - h$$

Find the domain of $f(x) = \sqrt{3 - |x-1|}$.

SCORE: _____ / 14 PTS

$$3 - |x-1| \geq 0$$

$$|x-1| \leq 3$$

$$-3 \leq x - 1 \leq 3$$

$$-2 \leq x \leq 4$$

Match the equations of 4 lines (on the right) to the corresponding graphs (on the left).
Each equation corresponds to only one graph, so some graphs do **NOT** correspond to any equation.

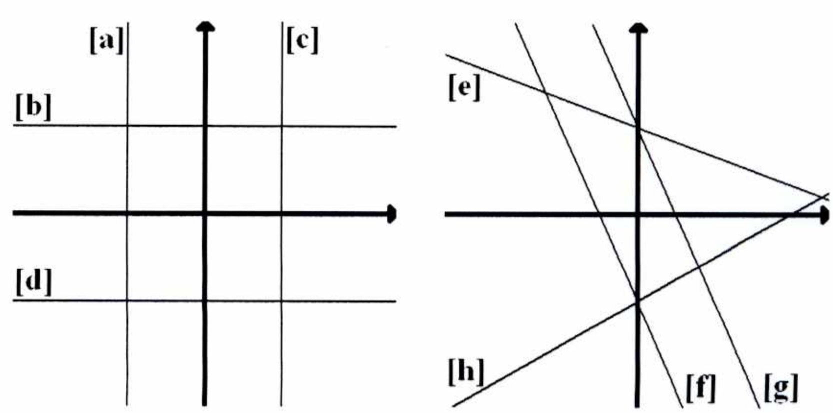
SCORE: _____ / 10 PTS

$y = \frac{1}{2}x - 2$ corresponds to graph h

$x = -2$ corresponds to graph a

$y = -2x + 2$ corresponds to graph g

$y = 2$ corresponds to graph b



One night a week for 30 weeks, students in a science class counted the average number of cricket chirps per minute at 11 pm, and noted the outside temperature. Their data fit the linear relationship $T = \frac{1}{4}C + 37$, where T was the temperature in degrees Fahrenheit $(°F)$, and C was the number of cricket chirps per minute.

SCORE: _____ / 10 PTS

[a] Which one of the following statements about the slope is true ? **Circle the number of the correct answer.**

[1] The slope tells us, on average, how many extra times per minute the crickets chirped when the temperature increased one degree.

[2] The slope tells us the average rate that the number of cricket chirps increased each week.

[3] The slope tells us the average rate that the temperature increased each week.

[4] The slope tells us how much the temperature generally increased for each extra cricket chirp per minute .

[5] Statements [1] through [4] are all false.

[b] Which one of the following statements about the $T-$intercept is true ? **Circle the number of the correct answer.**

[i] The $T-$intercept tells us the temperature when the students started counting the cricket chirps.

[ii] The $T-$intercept tells us the temperature at which the crickets stopped chirping.

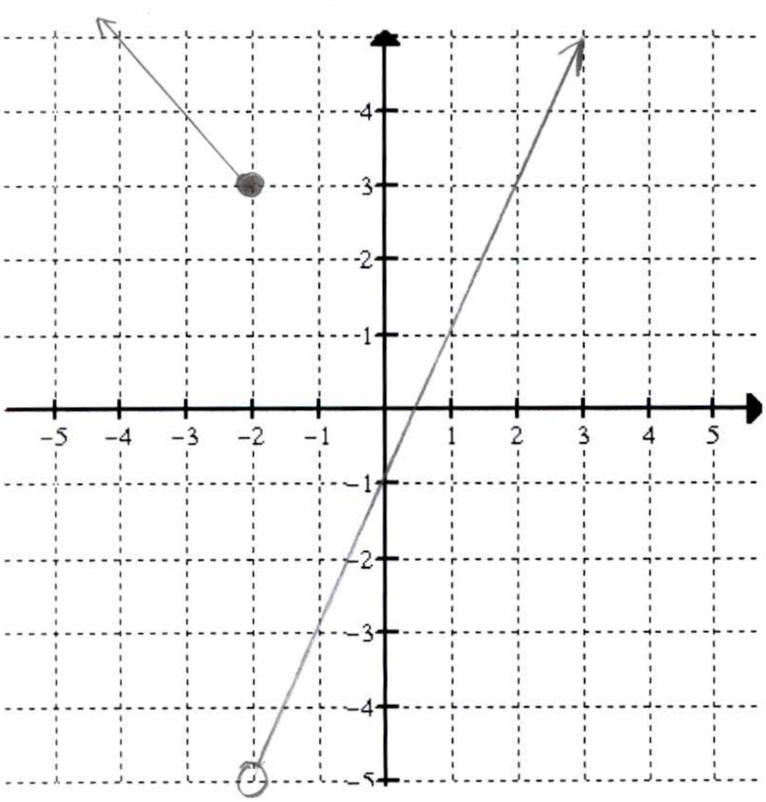
[iii] The $T-$intercept tells us the temperature at which the crickets were chirping 37 times per minute.

[iv] The $T-$intercept tells us the average number of cricket chirps per minute when the temperature was 0 .

[v] Statements [i] through [iv] are all false.

Graph the function $f(x) = \begin{cases} 1-x, & x \le -2 \\ 2x-1, & x > -2 \end{cases}$.

SCORE: _____ / 14 PTS



Consider the function $g(x) = 3\sqrt{-\frac{1}{2}x - 1}$. $= 3\sqrt{-\frac{1}{2}(x+2)}$

SCORE: _____ / 22 PTS

[a] What parent function f is the graph of g based on ?

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

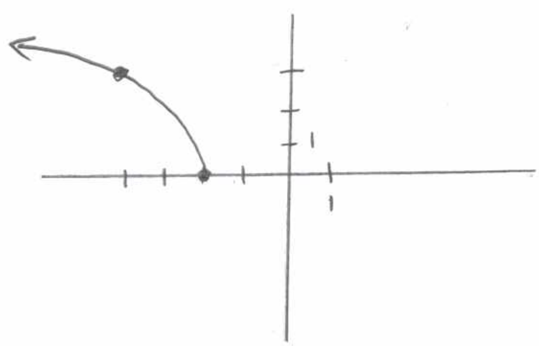
[b] Describe the sequence of transformations from f to g (in the correct order).

REFLECT HORIZONTALLY OVER Y-AXIS
STRETCH VERTICALLY AWAY FROM X-AXIS (FACTOR 3)
STRETCH HORIZONTALLY AWAY FROM Y-AXIS (FACTOR 2)
SHIFT LEFT 2

[c] The points $(0, 0)$ and $(1, 1)$ were on the graph of f. What points on the graph of g were those points transformed into ?

$(0,0) \to (0,0) \to (0,0) \to (0,0) \to (-2,0)$
$(1,1) \to (-1,1) \to (-1,3) \to (-2,3) \to (-4,3)$

[d] Sketch the graph of g using the answers to [b] and [c]. Label the answers to [c] on the graph.



Determine if the function $f(x) = \dfrac{1+x^4}{x-x^3}$ is even, odd or neither, and describe the symmetry.

SCORE: _____ / 10 PTS

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

ODD

SYMMETRY OVER ORIGIN

Write the linear function f such that $f(-3)=5$ and $f(-7)=-1$. **SCORE: _____ / 14 PTS**

$(-3,5)\quad(-7,-1)$

$m=\frac{-1-5}{-7-3}=\frac{-6}{-4}=\frac{3}{2}$

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

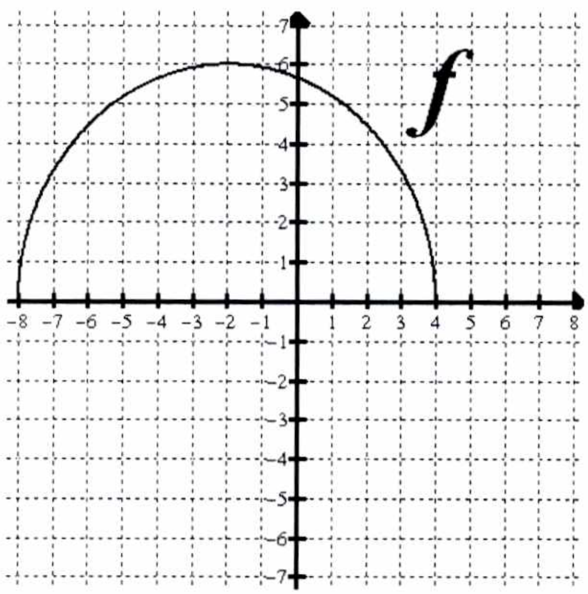
$f(-3)=\frac{3}{2}(-3)+b$

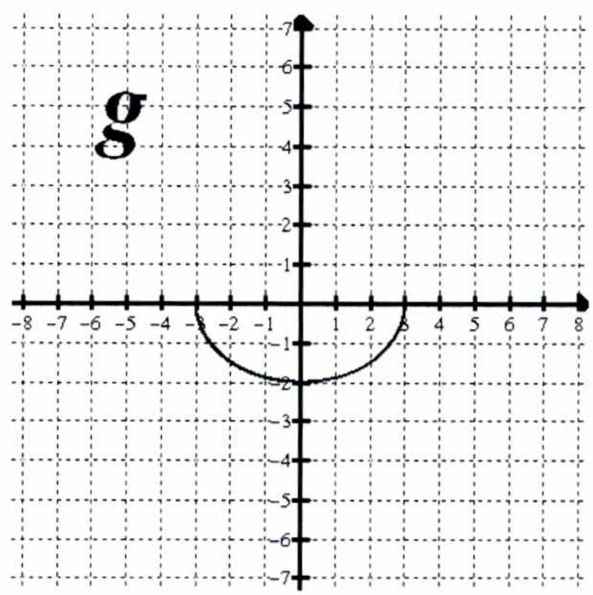
$5=-\frac{9}{2}+b$

$\frac{19}{2}=b$

$f(x)=\frac{3}{2}x+\frac{19}{2}$

Consider the functions f and g shown below. **SCORE: _____ / 14 PTS**





[a] Describe the sequence of transformations from f to g (in the correct order).

REFLECT VERTICALLY OVER X-AXIS

COMPRESS VERTICALLY TOWARDS X-AXIS (FACTOR $\frac{1}{3}$)

COMPRESS HORIZONTALLY TOWARDS Y-AXIS (FACTOR $\frac{1}{2}$)

SHIFT RIGHT 1

[b] Use function notation to write g in terms of f.

$g(x)=-\frac{1}{3}f(2(x-1))$

Complete the following definition: **SCORE: ______ / 4 PTS**

A function f has a local maximum at $x = a$ if and only if

$f(x) \le f(a)$ FOR ALL X IN AN INTERVAL AROUND a

If $f(x) = x - 1$ and $g(x) = 2 - \sqrt{x-1}$, find the value(s) of x for which $f(x) = g(x)$. **SCORE: _____ / 14 PTS**

$$x - 1 = 2 - \sqrt{x-1}$$
$$x - 3 = -\sqrt{x-1}$$
$$x^2 - 6x + 9 = x - 1$$
$$x^2 - 7x + 10 = 0$$
$$(x-2)(x-5) = 0$$
$$x = 2 \text{ OR } x = 5$$

CHECK:

$x = 2$: $f(2) = 2 - 1 = 1$

$g(2) = 2 - \sqrt{1} = 1$

$x = 5$: $f(5) = 5 - 1 = 4$

$g(5) = 2 - \sqrt{4} = 0$

$$\boxed{x = 2}$$