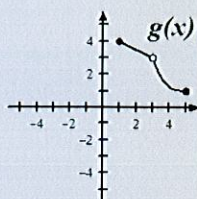


[ ] Let  $f(x) = \frac{5x+11}{7-3x}$ .

SCORE: / 63 PTS

Let  $g$  be the function whose graph is shown on the right.



Let  $h$  be the function given by the table of values below.

$x =$	0	1	2	3	4	5
$h(x) =$	3	2	5	4	1	0

4 [a] Find  $[[f(4)]]$ .

$$\left[\frac{31}{-5}\right] = \left[-6.2\right] = -7$$

ANSWER: -7

4 [b] Find the domain of  $f$ .

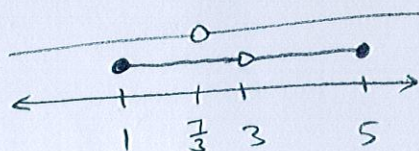
$$\begin{aligned} 7-3x &\neq 0 \\ -3x &\neq -7 \\ x &\neq \frac{7}{3} \end{aligned}$$

ANSWER:  $(-\infty, \frac{7}{3}) \cup (\frac{7}{3}, \infty)$

4 [c] Find the domain of  $g$ .

ANSWER:  $[1, 3) \cup (3, 5]$

4 [d] Find the domain of  $f - g$ .



ANSWER:  $[1, \frac{7}{3}) \cup (\frac{7}{3}, 3) \cup (3, 5]$

3 [e] Find  $g^{-1}(1)$ .

$$\begin{aligned} g^{-1}(1) &= x \\ g(x) &= 1 \\ x &= 5 \end{aligned}$$

ANSWER: 5

4 [f] Find the range of  $g$ .

ANSWER:  $[1, 3) \cup (3, 4]$

4 [g] Find the range of  $g^{-1}$ .

DOMAIN OF  $g$  = RANGE OF  $g^{-1}$

ANSWER:  $[1, 3) \cup (3, 5]$

THIS QUESTION CONTINUED ON NEXT PAGE



# THESE QUESTIONS CONTINUED FROM PREVIOUS PAGE

3 [h] Find the zero(s) of  $h$ .

$$h(x) = 0$$

$$x = 5$$

ANSWER:

$$\underline{5}$$

(3)

4 [i] Find  $(\frac{g}{f})(5)$ .

$$\frac{g(5)}{f(5)} = \frac{1}{\frac{36}{-8}} = -\frac{8}{36} = -\frac{2}{9}$$

(1) (1)

ANSWER:

$$\underline{-\frac{2}{9}}$$

(2)

4 [j] Find  $(gh)(1)$ .

$$g(1)h(1) = 4(2) = 8$$

(1) (1)

ANSWER:

$$\underline{8}$$

(2)

4 [k] Find  $(f \circ h^{-1})(3)$ .

$$f(h^{-1}(3)) = f(0) = \frac{11}{7}$$

(2)

ANSWER:

$$\underline{\frac{11}{7}}$$

(2)

4 [l] Find  $(g \circ g^{-1})(5)$ .

5 IS NOT IN DOMAIN OF  $g^{-1}$   
RANGE OF  $g$

ANSWER:

UNDEFINED

(4)

7 [m] Find the average rate of change of  $h$  from  $x_1 = 1$  to  $x_2 = 5$ .

$$\frac{h(5) - h(1)}{5 - 1} = \frac{0 - 2}{5 - 1} = \frac{-2}{4} = -\frac{1}{2}$$

(4)

ANSWER:

$$\underline{-\frac{1}{2}}$$

(3)

10 [n] Find the difference quotient  $\frac{f(x) - f(1)}{x - 1}$ .

ANSWER:

$$\frac{\frac{5x+11}{7-3x} - 4}{x-1} = \frac{5x+11-4(7-3x)}{(x-1)(7-3x)} = \frac{5x+11-28+12x}{(x-1)(7-3x)}$$

(2) (2)

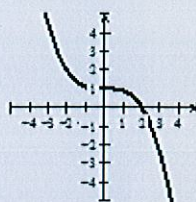
$$= \frac{17x-17}{(x-1)(7-3x)} = \frac{17(x-1)}{(x-1)(7-3x)} = \frac{17}{7-3x}$$

(2)



[ ] Let  $f$  be the function whose graph is shown here.

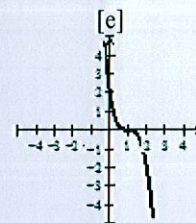
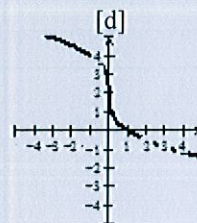
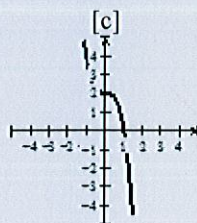
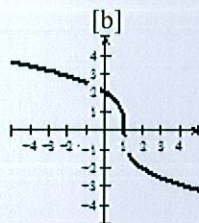
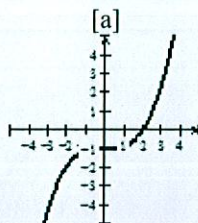
SCORE: / 7 PTS



Which of the graphs below is  $f^{-1}$ ?

ANSWER:

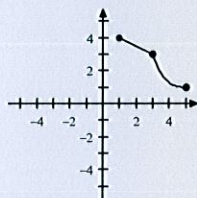
(7)  
B



- [ ] You are trying to sketch the graph of an equation. You draw **part** of the graph as shown below.  
 Replacing  $x$  with  $-x$  does not yield an equivalent equation.  
 Replacing  $y$  with  $-y$  yields an equivalent equation.  
 Replacing  $x$  with  $-x$  and  $y$  with  $-y$  does not yield an equivalent equation.

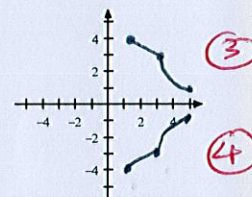
SCORE: / 7 PTS

Partially drawn graph



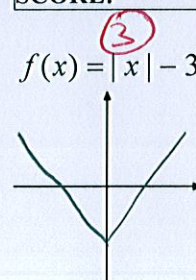
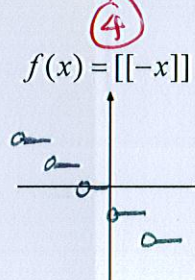
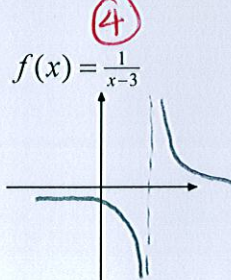
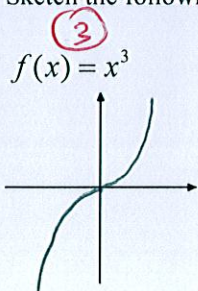
Sketch the entire graph of the equation on the axes on the right.

ANSWER:



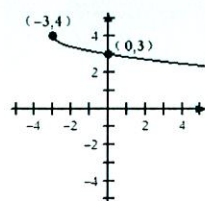
- [ ] Sketch the following graphs.

SCORE: / 14 PTS



- [ ] Let  $f$  be the function whose graph (a half-parabola) is shown below.  
 Find the equation for  $f$  using transformations.

SCORE: / 14 PTS



PARENT FUNCTION  $f(x) = \sqrt{x}$   
 VERTICAL REFLECTION  
 SHIFT UP 4  
 HORIZONTAL STRETCH (FACTOR 3)  
 SHIFT LEFT 3  
 $-f(\frac{1}{3}(x+3)+4)$

ANSWER:

$-\sqrt{\frac{1}{3}(x+3)+4}$   
 (2) (3) (2) (2) (2)  
 (3) CORRECT ORDER INSIDE  $\sqrt{\quad}$



- [ ] According to the Old Farmer's Almanac, you can find the outdoor temperature by first counting the number of cricket chirps per minute. The function  $T(c) = \frac{4}{5}c + 4$  then gives the temperature in degrees Celsius, where  $c$  is the number of cricket chirps per minute. SCORE: / 14 PTS

- 6 [a] Find the  $c$ - and  $T$ -intercepts of the function.

$$T\text{-INT: } T(0) = \frac{4}{5}(0) + 4 = 4$$

$$C\text{-INT: } 0 = \frac{4}{5}c + 4$$

$$\frac{4}{5}c = -4 \rightarrow c = -5$$

ANSWER:

$c$ -int -5 (3)

$T$ -int 4 (3)

- 4 [b] Interpret the meaning of the  $T$ -intercept in context.

Do not use any of the following variables in your answer:  $c, T, x, y$

Do not use any of the following words in your answer:

intercept, axis, vertical, horizontal, input, output, graph, function, variable, slope, rise, run

ANSWER: (4) AT 4°C, THE CRICKETS WILL STOP CHIRPING

- 4 [c] Interpret the meaning of the slope in context.

Do not use any of the following variables in your answer:  $c, T, x, y$

Do not use any of the following words in your answer:

intercept, axis, vertical, horizontal, input, output, graph, function, variable, slope, rise, run

ANSWER: (4) EACH ADDITIONAL CHIRP PER MINUTE CORRESPONDS TO A  $\frac{4}{5}^\circ\text{C}$  INCREASE IN TEMPERATURE

[ ] Let  $f(x) = 2\sqrt{-x+1} - 5$ .

SCORE: / 21 PTS

4 [a] List the sequence of transformations in correct order from the parent function to  $f$ .

TRANSFORMATION #1: VERTICAL STRETCH (FACTOR 2) TRANSFORMATION #4: REFLECT OVER y-AXIS  
(leave blank if < 4 transformations)

#1 BEFORE #2

TRANSFORMATION #2: SHIFT DOWN 5 TRANSFORMATION #5: \_\_\_\_\_  
(leave blank if < 2 transformations) (leave blank if < 5 transformations)

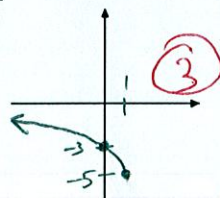
#3 BEFORE #4

TRANSFORMATION #3: SHIFT LEFT 1 TRANSFORMATION #6: \_\_\_\_\_  
(leave blank if < 3 transformations) (leave blank if < 6 transformations)

7 [b] Sketch the graph of  $f$  using transformations. Label appropriate scales on the x- and y-axes.

Show the step-by-step transformation of 2 points on the parent function as shown in lecture.

$(0,0) \rightarrow (0,0) \rightarrow (0,-5) \rightarrow (-1,-5) \rightarrow (1,-5)$   
 $(1,1) \rightarrow (1,2) \rightarrow (1,-3) \rightarrow (0,-3) \rightarrow (0,-3)$  ANSWER:



10 [c] Find  $f^{-1}(x)$ .

ANSWER:  $f^{-1}(x) = 1 - \left(\frac{x+5}{2}\right)^2$

Handwritten work:

$$y = 2\sqrt{-x+1} - 5$$

$$x = 2\sqrt{-y+1} - 5$$

$$x+5 = 2\sqrt{-y+1}$$

$$\frac{x+5}{2} = \sqrt{-y+1}$$

$$\left(\frac{x+5}{2}\right)^2 = -y+1$$

$$y = 1 - \left(\frac{x+5}{2}\right)^2 = \frac{4 - (x^2 + 10x + 25)}{4} = \frac{-x^2 - 10x - 21}{4}$$