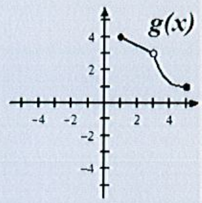
[ ] Let $f(x)=\dfrac{7x+11}{5-2x}$.

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

4 [a] Find $[[f(5)]]$. **ANSWER:** -10 (2)

$\left[\frac{46}{-5}\right]=\left[-9\frac{1}{5}\right]=-10$ (2)

4 [b] Find the domain of g. **ANSWER:** $[1,3)\cup(3,5]$ (2) (2)

4 [c] Find the domain of f. **ANSWER:** $(-\infty,\frac{5}{2})\cup(\frac{5}{2},\infty)$ (2)

$5-2x\neq 0$

$-2x\neq -5$

$x\neq\frac{5}{2}$ (2)

4 [d] Find the domain of $f+g$. **ANSWER:** $[1,\frac{5}{2})\cup(\frac{5}{2},3)\cup(3,5]$ (4)

1 $\frac{5}{2}$ 3 5

3 [e] Find the zero(s) of h. **ANSWER:** 3 (3)

$h(x)=0$

$x=3$

4 [f] Find the range of g^{-1}. **ANSWER:** $[1,3)\cup(3,5]$ (2)

= DOMAIN OF g (2)

4 [g] Find the range of g. **ANSWER:** $[1,3)\cup(3,4]$ (2) (2)

THIS QUESTION CONTINUED ON NEXT PAGE

3 [h] Find $g^{-1}(1)$. ANSWER: 5 ②

$g^{-1}(1) = x$

$g(x) = 1$ ①

$x = 5$

4 [i] Find $(gf)(1)$. ANSWER: 24 ②

$g(1)f(1) = (4)\left(\frac{18}{3}\right) = 4(6) = 24$

① ①

4 [j] Find $(\frac{h}{f})(4)$. ANSWER: $-\frac{3}{13}$ ④

$\frac{h(4)}{f(4)} = \frac{3}{\frac{39}{-3}} = \frac{3}{-13}$

4 [k] Find $(g \circ g^{-1})(5)$. ANSWER: UNDEFINED ④

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

IE. RANGE OF g

4 [l] Find $(f \circ h^{-1})(3)$. ANSWER: -13 ②

$f(h^{-1}(3)) = f(4) = -13$ ②

7 [m] Find the average rate of change of h from $x_1 = 1$ to $x_2 = 3$. ANSWER: -2 ③

$\frac{h(3)-h(1)}{3-1} = \frac{0-4}{3-1} = \frac{-4}{2} = -2$

④

10 [n] Find the difference quotient $\frac{f(x)-f(1)}{x-1}$. ANSWER: $\frac{19}{5-2x}$ ②

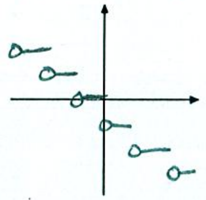
$\frac{\frac{7x+11}{5-2x} - 6}{x-1}$ ② $= \frac{7x+11-6(5-2x)}{(x-1)(5-2x)} = \frac{7x+11-30+12x}{(x-1)(5-2x)}$ ② ②

② $= \frac{19x-19}{(x-1)(5-2x)} = \frac{19(x-1)}{(x-1)(5-2x)} = \frac{19}{5-2x}$

[ ] Sketch the following graphs. **SCORE: / 14 PTS**

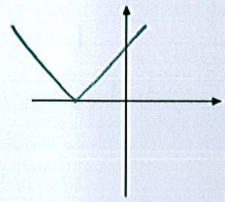
4

$f(x) = [[-x]]$



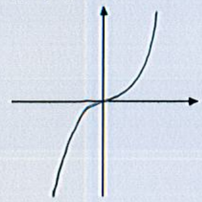
3

$f(x) = |x+3|$



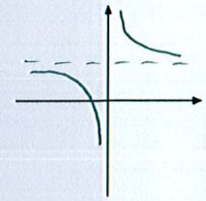
3

$f(x) = x^3$



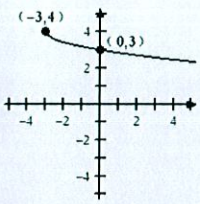
4

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



[ ] Let f be the function whose graph (a half-parabola) is shown below. **SCORE: / 14 PTS**

Find the equation for f using transformations.



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

VERTICAL REFLECTION

SHIFT UP 4

HORIZONTAL STRETCH (FACTOR 3)

SHIFT LEFT 3

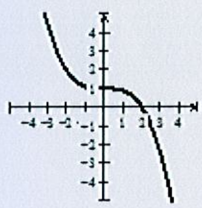
$-f(\frac{1}{3}(x+3))+4$

ANSWER: $-\sqrt{\frac{1}{3}(x+3)}+4$

2 3 2 2 2

3 CORRECT ORDER INSIDE $\sqrt{}$

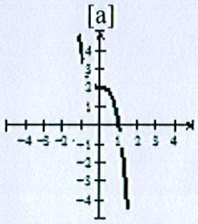
[ ] Let f be the function whose graph is shown here. **SCORE: / 7 PTS**



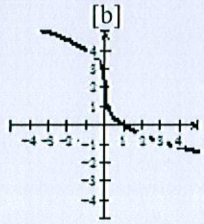
Which of the graphs below is f^{-1} ? **ANSWER:** E

7

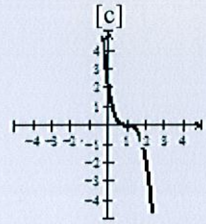
[a]



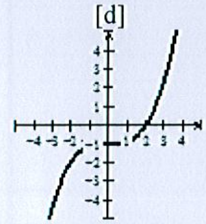
[b]



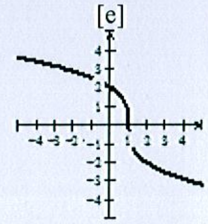
[c]



[d]



[e]



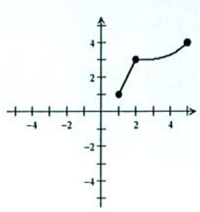
[ ] You are trying to sketch the graph of an equation. You draw **part** of the graph as shown below. **SCORE: / 7 PTS**

Replacing x with $-x$ does not yield an equivalent equation.

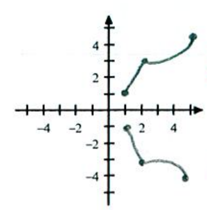
Replacing y with $-y$ yields an equivalent equation.

Replacing x with $-x$ and y with $-y$ does not yield an equivalent equation.

Partially drawn graph



Sketch the entire graph of the equation on the axes on the right. **ANSWER:**



3

4

[ ] Let $f(x) = -\sqrt{2x-5} + 1$. **SCORE: / 21 PTS**

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

1 TRANSFORMATION #1: REFLECT OVER X-AXIS

#1 BEFORE #2

1 TRANSFORMATION #2: SHIFT UP 1
(leave blank if < 2 transformations)

1 TRANSFORMATION #3: SHIFT RIGHT 5
(leave blank if < 3 transformations)

#3 BEFORE #4

1 TRANSFORMATION #4: HORIZONTAL COMPRESS (FACTOR $\frac{1}{2}$)
(leave blank if < 4 transformations)

TRANSFORMATION #5:
(leave blank if < 5 transformations)

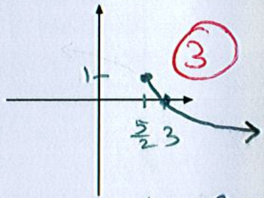
TRANSFORMATION #6:
(leave blank if < 6 transformations)

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.

$(0,0) \to (0,0) \to (0,1) \to (5,1) \to (\frac{5}{2},1)$ 2

$(1,1) \to (1,-1) \to (1,0) \to (6,0) \to (3,0)$ 2

ANSWER: 3



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

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

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

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

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

2 $2y - 5 = (1-x)^2$

2 $2y = (1-x)^2 + 5$

2 $y = \frac{(1-x)^2+5}{2} = \frac{1-2x+x^2+5}{2} = \frac{1}{2}x^2 - x + 3$

[ ] 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. **ANSWER:** $c-$int $\underline{-5}$ 3

$T-$int $\underline{4}$ 3

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

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

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

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

Do not use any of the following variables in your anwer: 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 $\frac{4}{5}$°C INCREASE IN TEMPERATURE