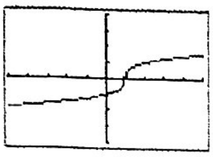
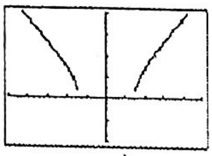
7. Find

Precalculus Unit 1 *Homework—Test Review*

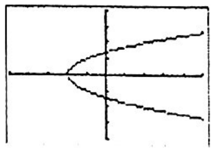
1. Determine which of the following are functions, have inverse functions, and are one-to-one.

a. 

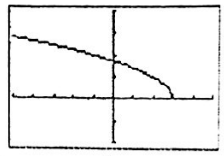
one to one

b. 

Function

c. 

Inverse function

d. 

one to one

2. Find two functions defined implicitly by each given relation:

a) $x^2 + 7 = y^2$

$y = \pm\sqrt{x^2+7}$

b) $9y^2 - 12xy + 4x^2 = 49$

$y = \frac{2x \pm 7}{3}$

3. Write an equation for each situation described below:

a) the squaring function is reflected over the x-axis and translated up 3 and left 2.

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

b) the logistic function vertically stretched by 3 and reflected over the y-axis

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

c) the square root function is horizontally shrunk by a factor of $\frac{3}{4}$ and translated right 6 spaces

$f(x) = \sqrt{\frac{4}{3}(x-6)}$

4. Determine algebraically whether the function is even, odd, or neither.

a) $f(x) = x + 7$
Neither

b) $f(x) = x^2 - 8x + 3$
Neither

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

d) $f(x) = 3x^3 - x - 8$
Neither

e) $f(x) = 5x^2 + 2$
Even

f) $f(x) = 5x^4 - 2x^2 + 1$
Even

5. Given $f(x) = 3x - 2$ and $g(x) = x^2 - 2x + 7$. Evaluate and then state the domain & range:

a) $(f+g)(x)$
$= x^2 + x + 5$
D: $(-\infty,\infty)$ R:

b) $f(x) \cdot g(x)$
$= 3x^3 - 8x^2 + 25x - 14$
D: $(-\infty,\infty)$ R: $(-\infty,\infty)$

c) $(f \circ g)(x)$
$= 3x^2 - 6x + 19$
D: $(-\infty,\infty)$ R:

d) $g(f(x))$
$= 9x^2 - 18x + 15$
D: $(-\infty,\infty)$ R:

6. Decompose the following functions. Write each given function as the composite of two functions, neither of which is the identity function.

a) $f(x) = \sqrt[3]{x^2 + 2}$

$f(x) = \sqrt[3]{x}$ $g(x) = x^2 + 2$

b) $g(x) = \sqrt{x+3} - \sqrt[3]{x+3}$

$f(x) = \sqrt{x} - \sqrt[3]{x}$ $g(x) = x + 3$

7. Find the inverse of each function. Give the domain of the inverse, including any restrictions inherited from f.

a) $f(x)=\dfrac{x+3}{x-2}$ $\quad f^{-1}(x)=\dfrac{2x+3}{x-1}$

$D: (-\infty,1)\cup(1,\infty)$

b) $f(x)=x^2+6$ $\quad f^{-1}(x)=\pm\sqrt{x-6}$

$D: [6,\infty)$

8. Verify algebraically that the following functions are inverses of one another:

a) $f(x)=\dfrac{1}{x+1}$ and $g(x)=\dfrac{1-x}{x}$

b) $f(x)=2x-6$ and $g(x)=\dfrac{x}{2}+3$

(a) $f(g(x))=\dfrac{1}{\frac{1-x}{x}+1}=\dfrac{1}{\frac{1}{x}-\frac{x}{x}+1}=\boxed{x}$

$g(f(x))=\dfrac{1-\frac{1}{x+1}}{\frac{1}{x+1}}=\left(1-\frac{1}{x+1}\right)\frac{x+1}{1}=x+1-1=\boxed{x}$

(b) $f(g(x))=2\left(\frac{x}{2}+3\right)-6$

$=x+6-6$

$\boxed{=x}$

$g(f(x))=\dfrac{2x-6}{2}+3$

$=x-3+3$

$\boxed{=x}$

9. Sketch each of the following functions IN ORDER TO answer the questions below:

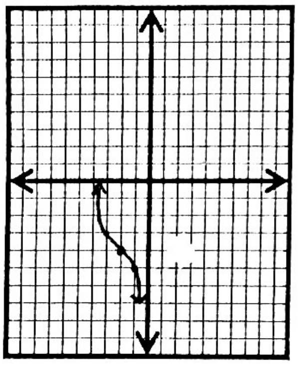
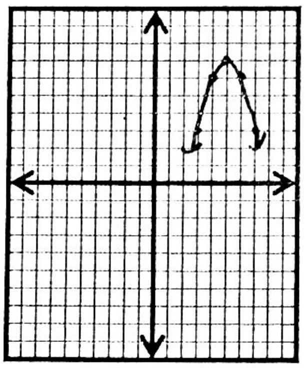
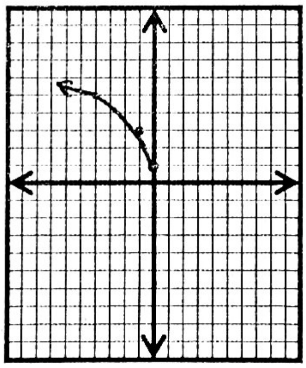
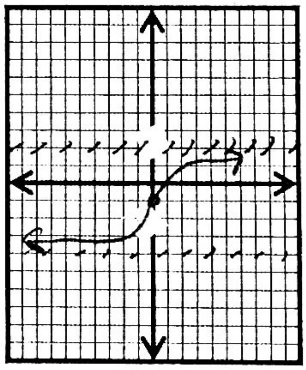
A $f(x)=(-x-2)^3-4$

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

B $g(x)=-(x-5)^2+7$

C $h(x)=2\sqrt{-x}+1$

D $j(x)=\dfrac{6}{1+e^{-x}}-4$

A) Which function(s) above is bounded above? bounded below? bounded? unbounded?

$g(x)$ $\quad h(x)$ $\quad j(x)$ $\quad f(x)$

B) Determine the domain and range of each function above:

$f(x)$	$g(x)$	$h(x)$	$j(x)$
D: $(-\infty,\infty)$	D: $(-\infty,\infty)$	D: $(-\infty,0]$	D: $(-\infty,\infty)$
R: $(-\infty,\infty)$	R: $(-\infty,7]$	R: $[1,\infty)$	R: $(-4,2)$

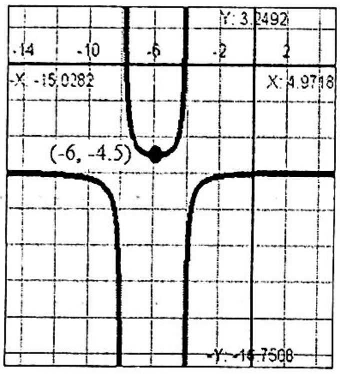
C) Determine the interval(s) over which the above functions are increasing and decreasing:

$f(x)$	$g(x)$	$h(x)$	$j(x)$
inc: —	inc: $(-\infty,5)$	inc: —	inc: $(-\infty,\infty)$
dec: $(-\infty,\infty)$	dec: $(5,\infty)$	dec: $(-\infty,0]$	dec: —

D) Determine the absolute & local max & min(s) of the above functions:

	$f(x)$	$g(x)$	$h(x)$	$j(x)$
Abs. Max:	—	7	—	—
Abs. Min:	—	—	1	—
Loc. Max:	—	7	—	—
Loc. Min:	—	—	1	—

10. Given the graph of a function, determine if it is continuous (if not, name the type of discontinuity). Find the equation of any horizontal or vertical asymptote. Determine the end behavior using limit notation, increasing/decreasing interval(s), domain/range, and max/min. Write "None" or "N/A" if something does not apply to that function.



Continuity: Infinite Discontinuity

Horizontal Asymptote: $y=-6$ Vertical Asymptotes: $x=-4$ $x=-8$

Right End Behavior: $\lim_{x\to\infty} f(x)=-6$

Left End Behavior: $\lim_{x\to-\infty} f(x)=-6$

Increasing Interval(s): $(-8,-4)\cup(-4,\infty)$ Decreasing Interval(s): $(-\infty,-8)\cup(-8,-6)$

Domain: $(-\infty,-8)\cup(-8,-4)\cup(-4,\infty)$ Range: $(-\infty,-6)\cup[-4.5,\infty)$

Local Max: — Local Min: -4.5

Abs. Max: — Abs. Min: —

11. Graph the piecewise function: $\begin{cases} |x+1|, & x<-1 \\ 3, & -1\le x\le 4 \\ \frac{1}{2}x, & x>4 \end{cases}$

$|x+1|$

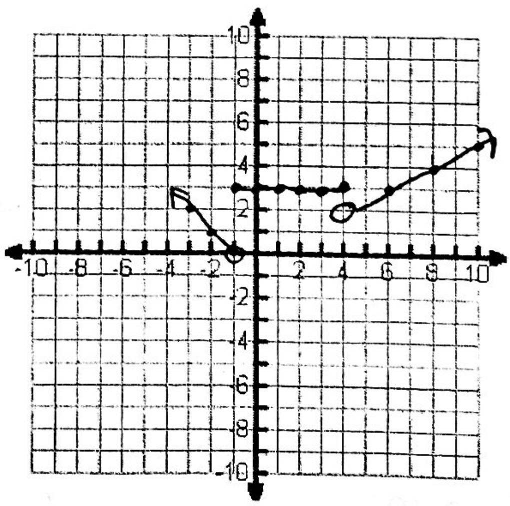
x	y
-3	2
-2	1
-1	0

3

x	y
-1	3
0	3
1	3
2	3
3	3
4	3

$\frac{1}{2}x$

x	y
4	2
6	3
8	4
10	5



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