(5 points each part)

MAC1105 Test 3 Name Key
(D. Howard 3-16)

1. Given the table for $f(x)$.

x	$f(x)$
-1	3
0	0
4	-8

Construct a **table** using your shifting rules that describes each of the new translated functions. You need not show a graph.

4.1 #5 a.) $-2f(x)$

X	$-2f(x)$
-1	-6
0	0
4	16

vert stretch by 2
flip x axis

b.) $f(\frac{1}{3}x)$

x	$f(\frac{1}{3}x)$
-3	3
0	0
12	-8

horiz stretch by 3

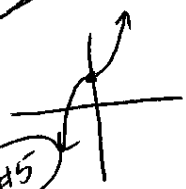
4.1 #6 c.) $f(x-4)$

x	$f(x-4)$
3	3
4	0
8	-8

right 4

2. Given the function $f(x) = x^3 + 1$.

4.1 #12 a.) Determine if the function is odd, even, or neither. Explain why.



not odd since not symmetric @ origin
not even since not symmetric @ y axis
Neither

4.3 #5 b.) Determine if the function is one-to-one. Explain why.

Yes, the HLT passes.

4.1 #6 c.) How has the function been shifted from its standard graph?

up 1

4.3 #9 d.) Find the inverse function.

$x = y^3 + 1$

$x - 1 = y^3$

$\sqrt[3]{x-1} = y = f^{-1}(x)$

4.1 #9 3.) The household assets in mutual funds can be modeled by $f(x) = 100x^{1.77}$ billion dollars, where x is the number of years since 1990. Write an equation that yields the same y-values when the exact year is entered.

x	Y
1990 → 0	#
1991 → 1	

x	Y
1990	#
1991	

$f(x) = 100(x-1990)^{1.77}$

4.2 #3

4. Given $f(x) = 3x+1$ and $g(x) = \sqrt{x+1}$. Find the following.

a.) $(f+g)(x) = 3x+1+\sqrt{x+1}$

b.) $(f/g)(x) = \dfrac{3x+1}{\sqrt{x+1}}$

4.2 #17

c.) $(f \circ g)(x) = f(\sqrt{x+1}) = 3\sqrt{x+1}+1$

d.) $(g \circ f)(x) = g(3x+1) = \sqrt{3x+1+1} = \sqrt{3x+2}$

e.) Are *f(x)* and *g(x)* inverses? Explain why or why not.

No since $f \circ g \neq g \circ f \neq x$

4.3 #15

5. If we assign numbers to the letters of the alphabet as follows and assign 27 to a blank space, we can convert a message to a numerical sequence. We can "encode" a message by doubling each number that represents a letter in a message and then subtract 2 so that it is encoded by using the function $C(x) = 2x-2$.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

a.) Find $C^{-1}(x) = \dfrac{x+2}{2}$

$x = 2y-2$

$\dfrac{x+2}{2} = \dfrac{2y}{2}$

b.) Decode the message 36 24 16 22 8

SMILE

$\frac{36+2}{2} = 19 = S$ $\quad \frac{16+2}{2} = 9 = I$

$\frac{24+2}{2} = 13 = M$ $\quad \frac{22+2}{2} = 12 = L$

$\frac{8+2}{2} = 5 = E$

4.4 #11

6. Solve $|3x+2| > 1$ by a method of your choice.

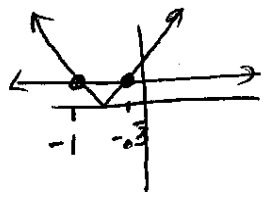
alg: $3x+2 = 1$ $\quad 3x+2 = -1$

$3x = -1$ $\quad 3x = -3$

$x = -\frac{1}{3}$ $\quad x = -1$

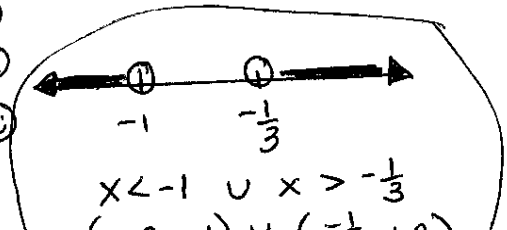
graph: $Y1 = \text{abs}(3x+2)$

$Y2 = 1$



where is vee above horiz?

x	Y
-2	4 > 1 ☺
-⅔	0 < 1 ☹
0	2 > 1 ☺



$x < -1 \cup x > -\frac{1}{3}$

7. Given the tables for $f(x)$ and $g(x)$. Find the following.

x	$f(x)$
-2	5
2	-2
3	0

x	$g(x)$
-2	3
2	8
5	-1

$f(3) = 0$

$g(-2) = 3$

x	$f^{-1}(x)$
5	-2
-2	2
0	3

$f^{-1}(-2) = 2$

4.2#9 a.) $(f \circ g)(-2) =$ $f(g(-2)) = f(3) = 0$

4.3#4 b.) $f^{-1}(-2) =$ 2

4.4#58 Solve $x^2 + 8x + 7 \le 0$.

a.) Algebraically.

$x^2 + 8x + 7 = 0$

$(x+1)(x+7) = 0$

$x+1 = 0 \qquad x+7 = 0$

$x = -1 \qquad x = -7$

OR $a = 1 \quad b = 8 \quad c = 7$

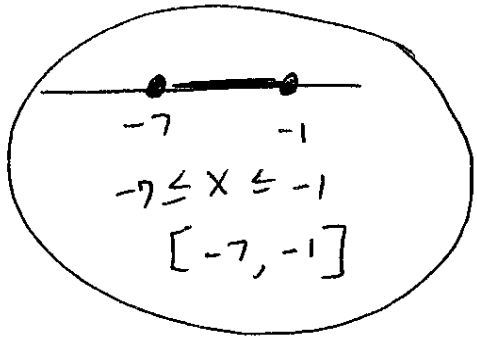
$$x = \frac{-8 \pm \sqrt{8^2 - 4(1)(7)}}{2(1)}$$

$$x = \frac{-8 \pm \sqrt{64 - 28}}{2}$$

$$x = \frac{-8 \pm \sqrt{36}}{2}$$

$$x = \frac{-8 \pm 6}{2} = \frac{-2}{2} = -1 \quad \text{OR} \quad \frac{-14}{2} = -7$$

x	y	
-8	$7 > 0$	☺
-2	$-5 < 0$	☹
0	$7 > 0$	☺



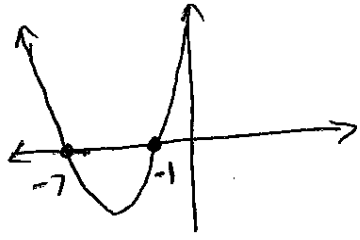
$-7 \le x \le -1$

$[-7, -1]$

b.) Graphically.

$Y1 = x^2 + 8x + 7$

$Y2 = 0$



where is ∪ below x axis?

$-7 \le x \le -1$

$[-7, -1]$