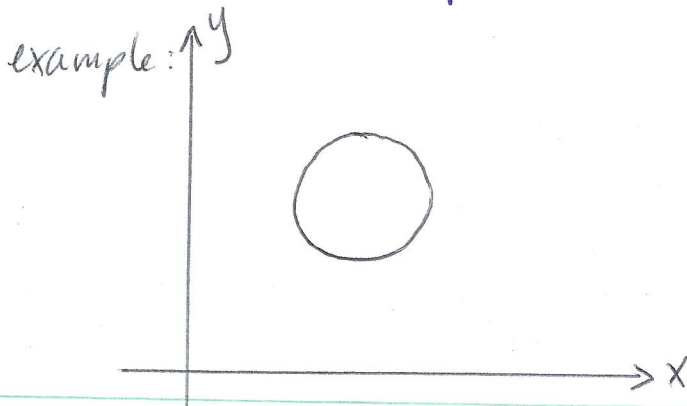


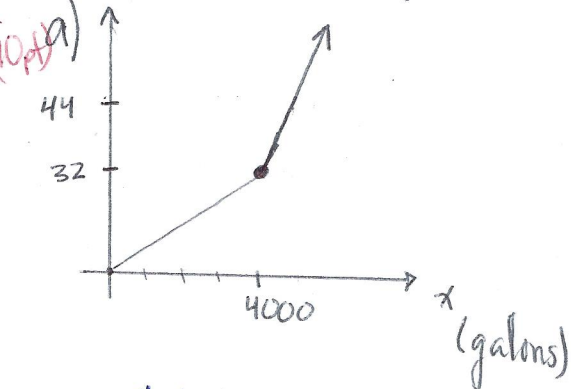
Math 113  
Group Quiz 3 Solutions

- ① Any graph of a relation which fails the vertical line test is an acceptable answer here.  
(10 pts)



- ② 0 - 4000 gallons: \$0.008/gallon

4000+ gallons: \$0.012/gallon



$$C(x) = \begin{cases} 0.008x & , \text{if } 0 \leq x \leq 4000 \\ 32 + 0.012(x - 4000) & , \text{if } x > 4000 \end{cases}$$

It helps to try some values:

x	C(x)
0	0
4000	\$32
5000	\$32 + 0.012 \times (5000 - 4000) = 32 + 0.012 \times 1000 = 32 + 12 = \$44

Use this logic to arrive at the equation  
 $C(x) = 0.008x$ , if  $0 \leq x \leq 4000$

pay \$32 for the first 4000 gallons, then pay  $0.012 \times 1000 = \$12$  for the surplus 1000 gallons.

Use this logic to arrive at the equation  
 $C(x) = 32 + 0.012(x - 4000)$  if  $x > 4000$

(2) b) The cost to a household using 4010 gallons during a month  
(5pt) is \$32.12.

$$\begin{aligned} C(4010) &= 32 + 0.012(4010 - 4000) \\ &= 32 + 0.012(10) \\ &= 32 + 0.12 \\ &= \$32.12 \end{aligned}$$

Use the 2nd half of  
the piecewise function  
found in part (a) since  
 $4010 > 4000$ .

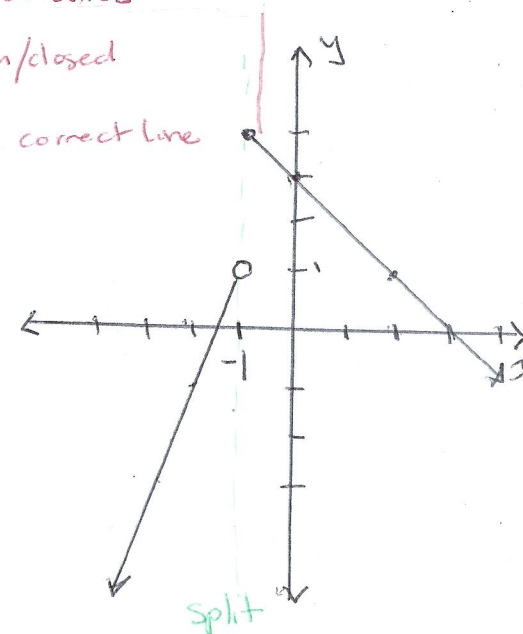
c) The cost to a household using 2000 gallons during a  
(5pt) month is \$16.

$$\begin{aligned} C(2000) &= 0.008(2000) \\ &= \$16 \end{aligned}$$

Use the 1st half of the  
piecewise function found  
in part (a) because  
 $0 \leq 2000 \leq 4000$ .

③ a)  $f(x) = \begin{cases} 2x+3 & \text{if } x < -1 \\ 3-x & \text{if } x \geq -1 \end{cases}$

2 - label axes  
2 - open/closed  
3 each correct line



$x < -1$

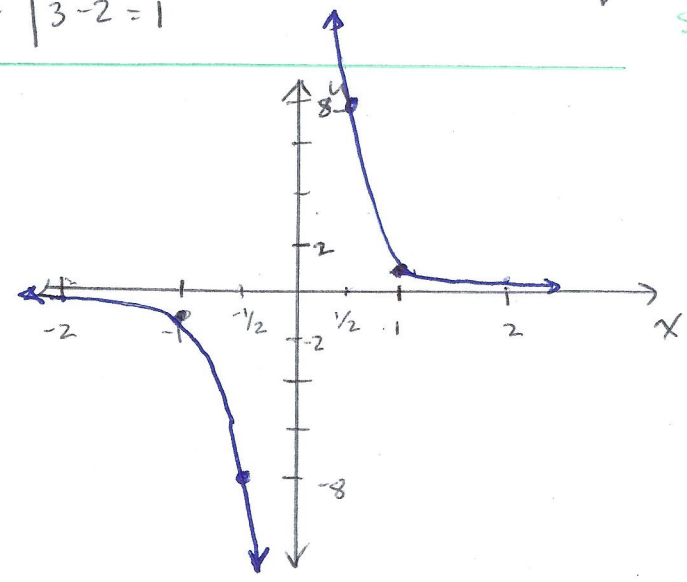
x	f(x)
-1	-2+3 = 1 (open)
-2	-4+3 = -1
-3	-6+3 = -3

$x \geq -1$

x	f(x)
-1	3-(-1) = 4 (closed)
0	3-0 = 3
1	3-1 = 2
2	3-2 = 1

b)  $g(x) = \frac{1}{x^3}$

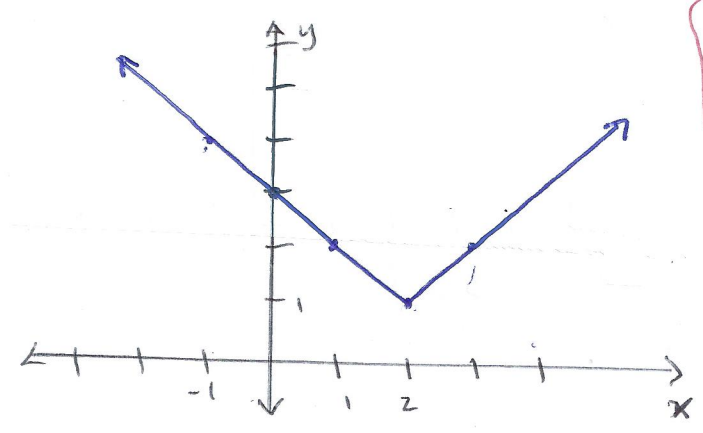
x	g(x)
0	DNE $0 \notin \mathbb{D}_g$
1	1
-1	-1
$\frac{1}{2}$	$(\frac{1}{2})^3 = \frac{1}{8} = 0.125$
$-\frac{1}{2}$	$(-\frac{1}{2})^3 = -\frac{1}{8} = -0.125$
2	$(\frac{1}{2})^3 = \frac{1}{8}$
-2	$(-\frac{1}{2})^3 = -\frac{1}{8}$



2 - label axes  
8 - graph

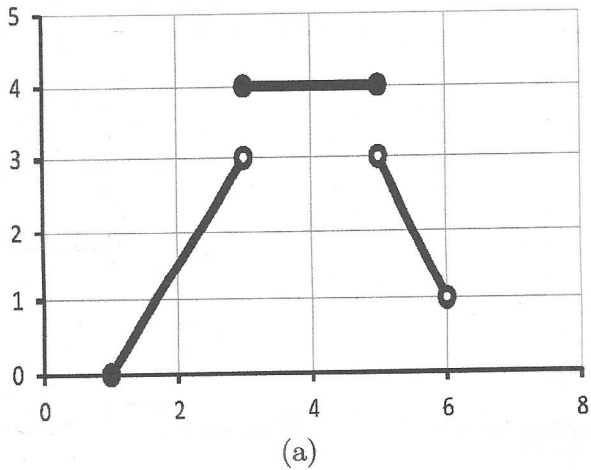
c)  $h(x) = 1 + |x-2|$

x	h(x)
0	$1 +  -2  = 1 + 2 = 3$
1	$1 +  -1  = 2$
-1	$1 +  -3  = 4$
2	$1 +  0  = 1$
-2	$1 +  -4  = 5$
3	$1 +  1  = 2$
-3	$1 +  -5  = 6$



2 - label axes  
8 - graph

4. (40 points) Write a formula for the piecewise functions whose graphs are given here.



$$f(x) = \begin{cases} \frac{3}{2}x - \frac{3}{2} & \text{if } 1 \leq x < 3 \\ 4 & \text{if } 3 \leq x \leq 5 \\ -2x + 13 & \text{if } 5 < x < 6 \end{cases}$$

this portion is the easiest to fill in because the graph is constant in that section at  $f(x) = 4$

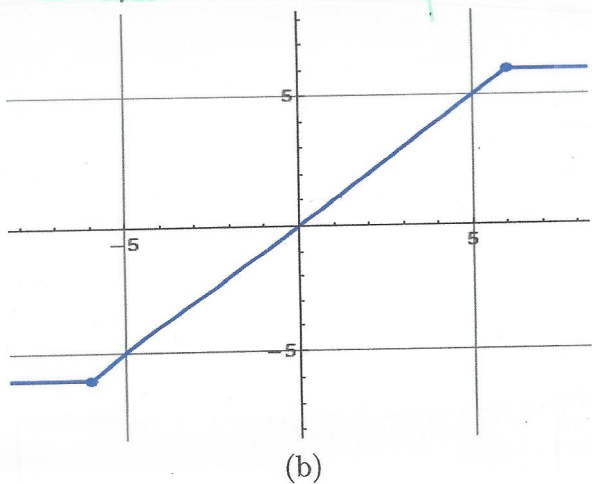
Consider 2 points you know lie on the linear graph:  
 $(5, 3) \neq (6, 1)$

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

$$y - 3 = -2(x - 5)$$

$$y - 3 = -2x + 10$$

$$y = -2x + 13$$



Consider 2 points you know lie on this linear graph:  $(1, 0) \neq (3, 3)$

$$\text{find slope: } \frac{3-0}{3-1} = \frac{3}{2}$$

$$y - 0 = \frac{3}{2}(x - 1)$$

$$y = \frac{3}{2}x - \frac{3}{2}$$

$$g(x) = \begin{cases} -6 & \text{if } x < -6 \\ x & \text{if } -6 \leq x \leq 6 \\ 6 & \text{if } x > 6 \end{cases}$$

note, since the graphs meet at the split points it does not matter if you use  $\leq$  or  $<$  signs.

As long as at least one portion includes the equal sign, the points  $x = 6 \neq x = -6$  will be accounted for.