Math 41 **name**_____

Exam 1 - A *show all relevant work to receive full credit*

September 22, 2010

1. a. Find the equation of the line though the point $(2,-1)$ and parallel to the line $2x-5y-10=0$

given line: $2x-5y-10=0$

$2x-10=5y$

$y=\frac{2}{5}x-2$

$m=2/5$

$m_{\parallel}=\frac{2}{5}$

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

$y+1=\frac{2}{5}x-\frac{4}{5}$

$y=\frac{2}{5}x-\frac{9}{5}$

b. Find the equation of the line through the point $\left(-\frac{2}{3},-\frac{11}{5}\right)$ and perpendicular to the y-axis.

perpendicular to y-axis $\rightarrow$ horizontal line $m=0$

$y=-\frac{11}{5}$

2. Since the appointment of Dean Peter Griffin, Ph D., J.D., M.D., D.D.S., B.F.F., L.O.L, as Dean of Students of a very small very liberal arts college in Quahog the enrollment has been increasing at a constant rate. Given that the enrollment was 500 in the year 2000, and had increased to 1000 by the year 2010.

Find a linear equation giving the enrollment, N in terms of the year t, where $t=0$ corresponds to the year 2000.

N in terms of t (t,N)

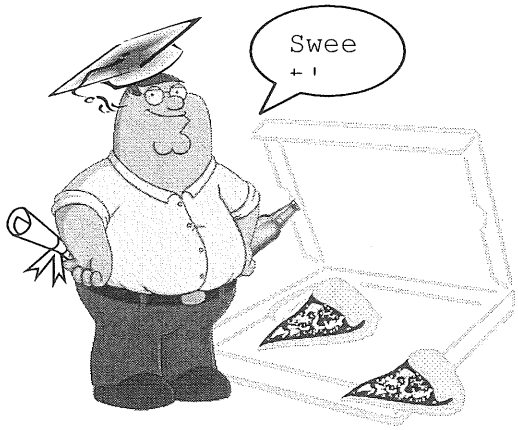
$(0,500)$ and $(10,1000)$

$m=\frac{\Delta N}{\Delta t}=\frac{1000-500}{10-0}=\frac{500}{10}=50$

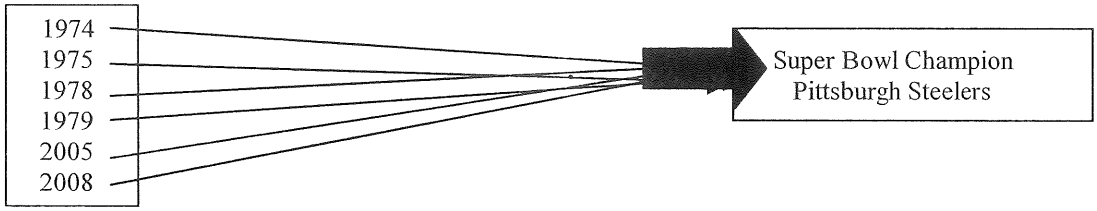
$N-N_1=m(t-t_1)$

$N-500=50(t-0)$

$N=50t+500$



3. a. Determine if the following relations is a function.

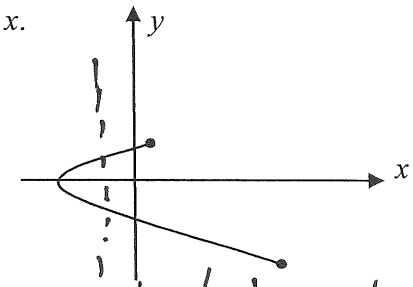


*Yes or No, **if not** explain.* Yes, function, for each x exactly one y.

b. Determine if the equation represents a function of y in terms of x. $y = 16 - 9x^2$

*Yes or No, **if not** explain.* Yes, function, for each x exactly one y.

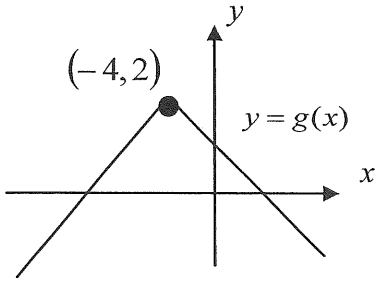
c. Determine if the graph represents a function of y in terms of x.



*Yes or No, **if not** explain.* No, graph fails vertical line test.

4. Use the graph of $f(x) = |x|$, to write the equation for the function $y = g(x)$ shown in the figure. *(Assume no vertical stretch nor shrink.)*

$g(x) = -|x+4| + 2$



5. For the function $f(x) = x^2 - 5x + 1$, find ***and*** simplify the difference quotient.

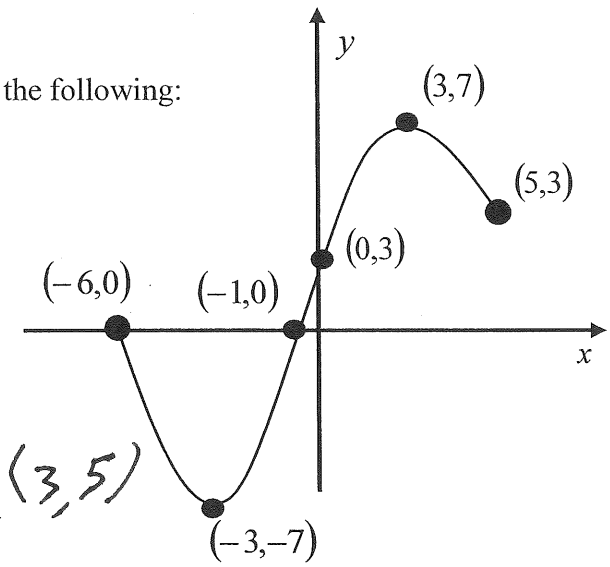
$$\frac{f(x+h)-f(x)}{h} = \frac{(x+h)^2 - 5(x+h) + 1 - (x^2 - 5x + 1)}{h}$$

$$= \frac{x^2 + 2xh + h^2 - 5x - 5h + 1 - x^2 + 5x - 1}{h}$$

$$= \frac{2xh + h^2 - 5h}{h} = \frac{h(2x + h - 5)}{h}$$

$$= 2x + h - 5$$

6. Use the graph of the function, $y = f(x)$ to find each of the following:



a. domain: [-6, 5]

range: [-7, 7]

b. Interval(s) on which f is increasing: (-3, 3)

Interval(s) on which f is decreasing: (-6, -3), (3, 5)

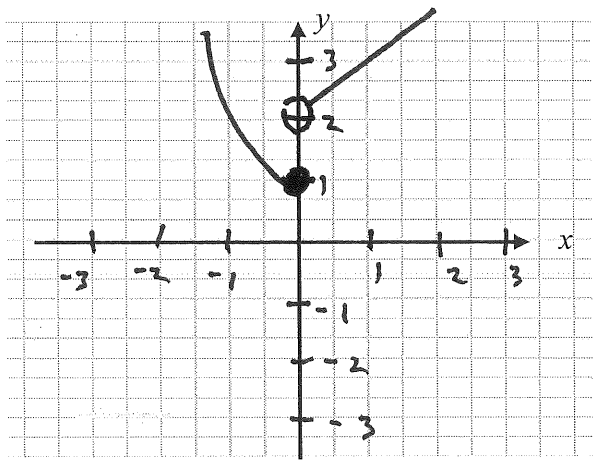
c. $f(3) =$ 7

d. value(s) of x such that $f(x) = 0$, $x =$ -6, -1

7. ***Describe*** (in words) the shape of the graph as well as any transformation of the graph of the function, $h(x) = -\frac{5}{2}|x+2| - 3$ relative to the graph of $f(x) = |x|$. *(Because a graph is not necessary, a graph alone will not receive credit)*

A v-shaped graph shifted 2 units left, reflected about x-axis, vertical stretch of 5/2 and shift 3 units downward.

8. ***Sketch*** a graph of the function. $f(x) = \begin{cases} x^2 + 1, & x \le 0 \\ x + 2, & x > 0 \end{cases}$



9. Answer **TRUE** or **FALSE** and **<u>if false, explain why it is false</u>** or provide a counterexample.

a) The graph of an even function is symmetric to the x-axis. False.

it is symmetric to the y-axis.
(it would not be a function if symmetric to x-axis)

b) The graph of an odd function is symmetric to the origin. True.

10. Given the functions, $f(x) = x^2 - 3x + 4$, $g(x) = 2x - 5$ to determine the following:

OR $(f+g)(x) = x^2 - x - 1$

a. $(f+g)(2) = f(2) + g(2)$

$= 2 + (-1) = 1$

$(f+g)(2) = 4 - 2 - 1 = 1$

b. $(f \circ g)(2) = f(g(2))$

$= f(-1)$

$= 8$

$f(g(x)) =$

$(2x-5)^2 - 3(2x-5) + 4$

$= 4x^2 - 26x + 44$

$f(g(2)) = 8$

11. Given the composite function $h(x) = f(g(x))$, find two functions f and g, such that $h(x) = f(g(x)) = \dfrac{1}{\sqrt{x^2+4}}$. *Answers are not necessarily unique.*

$f(x) = \dfrac{1}{\sqrt{x}}$

$g(x) = x^2 + 4$

12. Find $f^{-1}(x)$, if it exists, for $f(x) = 8x^3 + 1$. If it does not exist, provide a reason(s).

$y = 8x^3 + 1$

$x = 8y^3 + 1$

$x - 1 = 8y^3$

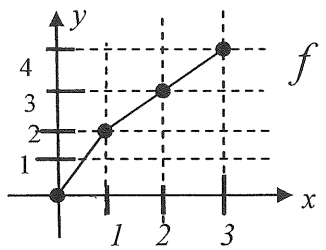
$\frac{x-1}{8} = y^3$

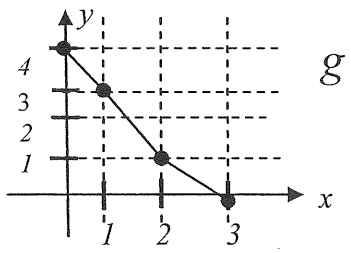
$y = \sqrt[3]{\frac{x-1}{8}} = \frac{1}{2}\sqrt[3]{x-1}$

13. (4 points): In your opinion,
the greatest song/title/record of all time, in any genre *(pop, rock, , punk, heavy metal, hip-hop, r&b, gospel, christian rock, blues, jazz, etc.)*

Answers will vary.

Extra: Use the graph of *f* and *g* to find each of the following:





a. $g(f(2)) =$ $\boxed{0}$

b. $(f^{-1} + g)(2) =$ $\boxed{2}$

c. $(g \circ f^{-1})(2) =$ $\boxed{3}$