Math 1200 (Spring'15) Exam 3A Teacher's & your name: Solution

**Show all your work** in order to get full credit. Each question is worth 6 points, but questions 9 and 10 are worth 5 points each.

1. It costs a company \$58 to produce 6 units of a product and \$78 to produce 10 units. Write the cost function, assuming that the cost function is linear.

| | y | x |
|---|---|---|
| 1' | 58 | 6 |
| 2' | 78 | 10 |

slope formula $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{78-58}{10-6} = \frac{20}{4} = 5$

$y = mx + b$

$y = 5x + b$

$\boxed{y = 5x + 28}$

substitute $x_1 = 6$, $y_1 = 58$ to find b

$58 = 5 \cdot 6 + b$ $\quad 58 = 30 + b \Rightarrow b = 28$

2. Write the equation of a line passing through (-8, -4) and perpendicular to the line $y = \boxed{\frac{1}{6}}x + 3$.

$m_1 = \frac{1}{6}$

$m_1 m_2 = -1$

$\frac{1}{6} m_2 = -1$

$m_2 = -6$

$y = m_2 x + b$

$y = -6x + b$

$m_1 \cdot m_2 = -1$

substitute $x = -8$, $y = -4$ into $y = -6x + b$ to find b

$-4 = -6 \cdot (-8) + b$

$-4 = 48 + b$

$-4 - 48 = b \quad b = -52$

$\boxed{y = -6x - 52}$

Use the function $g(x) = 3|x+2| - 1$ to answer questions 3-5.

3. What is the parent/base function?

$y = |x|$

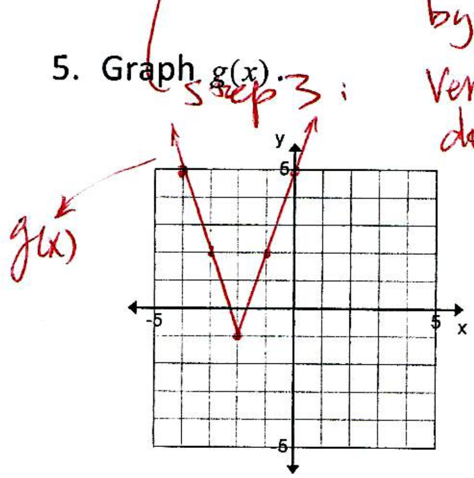
4. Describe the sequence of transformations from the parent/base function to g(x).

Step 1: Shift the graph of $y = |x|$ horizontally to the left by 2 units

Step 2: Vertically stretch the graph resulted from step 1 by a factor of 3.

Step 3: Vertically shift the graph resulted from step 2 downward by 1 unit.

5. Graph $g(x)$.



6. Check if the function is even, odd, or neither. $m(x) = x^2 + x^3$. Show your work.

Check "even"

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

$= x^2 - x^3$

$m(-x) \neq m(x)$

Not even

Check "odd"

$-m(-x) = -(x^2 - x^3)$

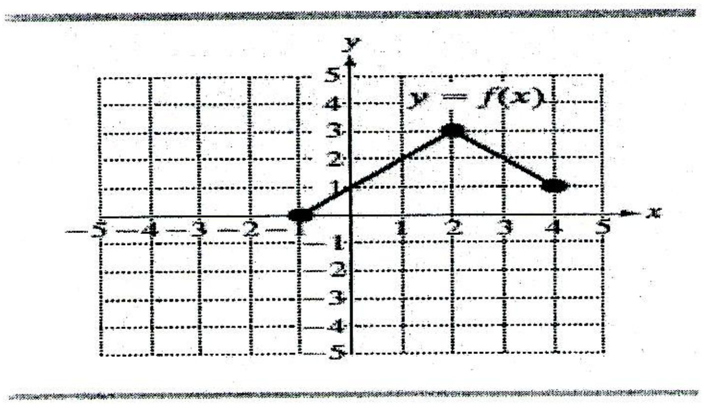
$= -x^2 + x^3$

$m(x) \neq -m(-x)$

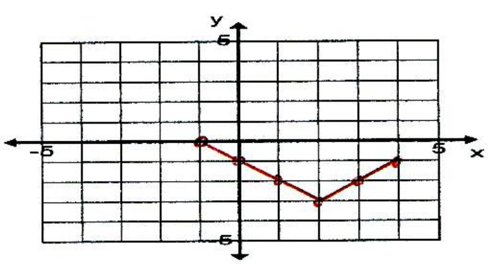
Not odd.

$\boxed{\text{Neither even nor od}}$

Use the graph of y = f(x) is given below to answer questions 7- 8.




7. Graph y = - f(x)




8. Find the intervals on which the graph of f(x) is increasing or decreasing.

increasing: $(-1, 2)$ | decreasing: $(2, 4)$

Use the following piece-wise function to answer question 9 – 10.

$$f(x) = \begin{cases} x^2 & for \quad -2 \le x < 1 \\ 3 & for \quad 1 \le x \le 4 \end{cases}$$

9. $-2 \le x < 1$

$f(-2)$

$= (-2)^2 = 4$

10. $1 \le x \le 4$

$f(1) = 3$

11. Find the difference quotient $\frac{f(x+h)-f(x)}{h}$. if $f(x)=x^2-3$.

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

then $\frac{f(x+h)-f(x)}{h} = \frac{x^2+2xh+h^2-3-(x^2-3)}{h}$

$= \frac{x^2+2xh+h^2-3-x^2+3}{h} = \frac{2xh+h^2}{h} = \boxed{2x+h}$

Given $f(x)=3x+4$ and $g(x)=\sqrt{x+1}$, find

12. $(f\circ g)(x) = f(g(x))$

$= 3\sqrt{x+1}+4$

13. the domain of $(f\circ g)(x)$

$x+1 \geq 0$

$x \geq -1$

domain : $[-1, \infty)$

14. Given $h(x)=\sqrt[3]{x+5}$, find the two functions $f$ and $g$ such that h(x) = $(f\circ g)(x)$.

$h(x) = (f\circ g)(x)$

$\boxed{f(x) = \sqrt[3]{x} \quad g(x) = x+5}$

Use the function $f(x)=(x+2)^2-1$ to answer questions 15 – 17:

15. Identify the vertex $\boxed{(-2, -1)}$

16. Find the x and y intercepts.

x - int.

let $y=0$ : $0 = (x+2)^2-1$

$(x+2)^2 = 1$

$x+2 = \pm 1$

$x+2=1$ or $x+2=-1$

$x=1-2$ $\quad$ $x=-1-2$

$x=-1$ or $x=-3$

$\boxed{(-1,0), (-3,0)}$

y - int.

let $x=0$

$y = (0+2)^2-1$

$= 4-1 = 3$

$\boxed{(0, 3)}$

17. Graph the function.