Test 1
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Math 111 – Fall 2009

Name: KEY

*The last thing one knows when writing
a book is what to put first.*

Blaise Pascal (1623 - 1662)
French mathematician

No work = no credit

Closed Book & Closed Notes

Warm-ups (1 pt each) $(-3)^2 =$ 9 $-3^2 =$ -9 $\dfrac{0}{5} =$ 0

1.) (1 pt) According to the quote by Pascal (see above), what is the last thing written in a book? Answer using complete sentences.

The beginning is the last thing written.

2.) (2 pts) Solve $2x - 10 = 4 - 2(x + 2)$ exactly.

$$2x - 10 = 4 - 2x - 4$$
$$4x = 10$$

Solution: $x = 5/2$

3.) (2 pts) Solve $x^2 + 10x + 10 = 0$ exactly.

$$\Rightarrow x = \frac{-10 \pm \sqrt{100 - 4(1)(10)}}{2(1)}$$

$$\Rightarrow x = \frac{-10 \pm \sqrt{60}}{2}$$

Solution: $x = -5 \pm \sqrt{15}$

4.) (2 pts) Solve $(2x - 1)^2 - 30 = 0$ exactly.

$$\Rightarrow (2x - 1)^2 = 30$$
$$\Rightarrow 2x - 1 = \pm\sqrt{30}$$
$$\Rightarrow 2x = 1 \pm \sqrt{30}$$

Solution: $x = \dfrac{1 \pm \sqrt{30}}{2}$

5.) (2 pts) Solve the inequality $5x + 3 > 4(1-x)$. Express your answer in interval notation.

$$\Rightarrow 5x + 3 > 4 - 4x$$

$$\Rightarrow 9x > 1$$

$$\Rightarrow x > \frac{1}{9}$$

$x > \frac{1}{9}$

Solution: $\left(\frac{1}{9}, \infty\right)$

6.) (2 pts) Solve $|1-2x| \le 7$. Express your answer in interval notation.

$$\Rightarrow -7 \le 1 - 2x \le 7$$

$$\Rightarrow -8 \le -2x \le 6$$

$$\Rightarrow 8 \ge 2x \ge -6$$

$$\Rightarrow 4 \ge x \ge -3$$

Solution: $[-3, 4]$

7.) (4 pts) Express the following expressions in the standard $z = a + bi$ form of a complex number.

a.) (2 pts) $(2-3i) + (-1+4i)$

Solution: $1 + i$

b.) (2 pts) $\dfrac{2-3i}{5+i} \cdot \dfrac{5-i}{5-i}$

$$\Rightarrow \frac{10 - 2i - 15i + 3i^2}{25 - i^2}$$

$$\Rightarrow \frac{7 - 17i}{26}$$

Solution: $\dfrac{7}{26} - \dfrac{17}{26}i$

8.) (2 pts) Find the *exact* distance between the two points $(-3, 6)$ and $(0, -4)$.

$$D = \sqrt{(0 - (-3))^2 + (-4 - 6)^2}$$

$$= \sqrt{9 + 100}$$

Solution: $\sqrt{109}$

9.) (2 pts) Find the equation of the line with slope 6 and y-intercept $(0, -13)$. Write your answer in slope-intercept form.

Solution: $y = 6x - 13$

10.) (2 pts) Find the slope and the y-intercept of the line $5x + 2y = 15$

$2y = -5x + 15$

$y = -\dfrac{5}{2}x + \dfrac{15}{2}$

Slope: $-\dfrac{5}{2}$ and y-intercept: $\dfrac{15}{2}$

11.) (2 pts) Find the equation of the line parallel to the line $3x - 4y = 10$ that passes through the point $(6, 0)$.

$+4y = +3x + 10$

$y = \dfrac{3}{4}x - \dfrac{5}{2}$

Same slope: $3/4$

$y - 0 = \dfrac{3}{4}(x - 6)$

$-3x + 4y = -18$

$y = \dfrac{3}{4}(x - 6)$

Solution: $y = \dfrac{3}{4}x - \dfrac{9}{2}$

12.) (1 pt) Is the function $g(x) = x^2 - 1$ a one-to-one function?   YES   ~~NO~~

13.) (2 pts) Given the function $h(x) = x^2 + 3x$, find $h(-5)$

$h(-5) = (-5)^2 + 3(-5)$

Solution: 10

14.) (2 pts) Find the vertex of the function $f(x) = x^2 - 3x - 10$.
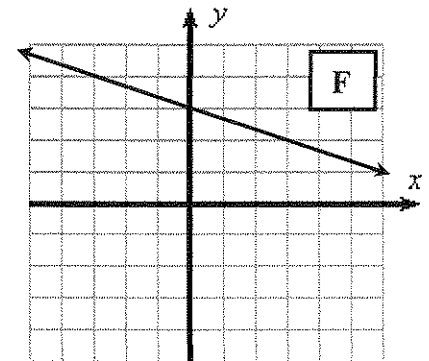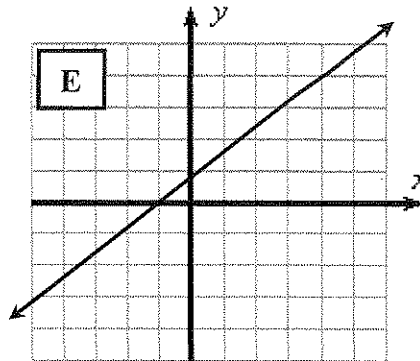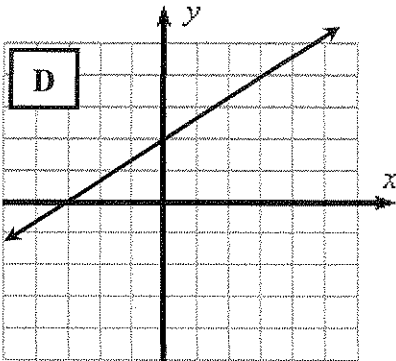
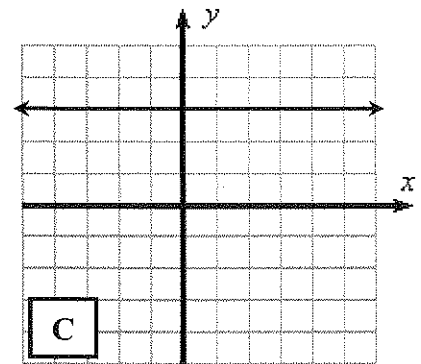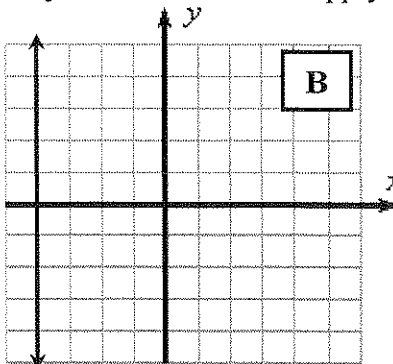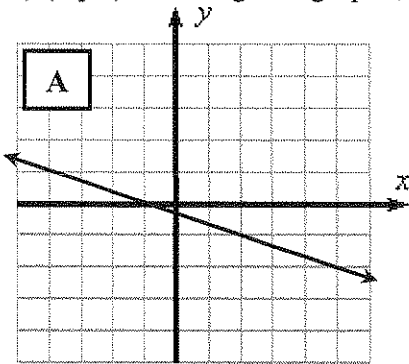$x = \dfrac{-b}{2a} = \dfrac{3}{2(1)} = \dfrac{3}{2}$

$f\left(\dfrac{3}{2}\right) = \dfrac{9}{4} - \dfrac{9}{2} - 10$

$= \dfrac{9 - 18 - 40}{4}$

$= \dfrac{-49}{4}$

Solution: $\left(\dfrac{3}{2}, \dfrac{-49}{4}\right)$

15.) (5 pts) For the given graphs, clearly check "X" all that apply

Clearly check "X" all that apply	A	B	C	D	E	F
a.) The line has a positive slope.				X	X	
b.) The line has a non-negative slope.			X	X	X	
c.) The line has a y-intercept of 3.			X			X
d.) The line has a slope of $-\dfrac{1}{3}$.	X					X
e.) The x-intercept is -1.	X				X	

16.) (2 pts) Given $h(x) = 3x - 5$, find and simplify the <u>equation</u> of $h^{-1}(x)$.
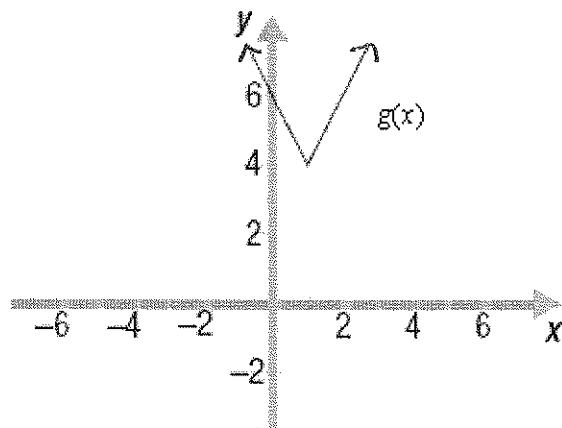
$$y = 3x - 5$$

$$x = 3y - 5 \quad \text{solve for } y.$$

$$\Rightarrow x + 5 = 3y$$

$$\Rightarrow y = \frac{x+5}{3}$$

Solution: $\underline{\quad y = \dfrac{x+5}{3} = h^{-1}(x). \quad}$

17.) (2 pts) Use the given graph of $g(x)$ to answer the following questions. Give answers in <u>interval notation</u>.

a.) (1 pt) What is the domain of g?

$(-\infty, \infty)$

b.) (1 pt) What is the range of g?

$[4, \infty)$

18.) (2 pts) Given $f(x) = 6x^4$ and $g(x) = 3x^3$, find $\left(\dfrac{f}{g}\right)(x) - (f \cdot g)(x)$ $\underline{simplify}$

$2x - 18x^7$

Solution: $\left(\dfrac{f}{g}\right)(x) - (f \cdot g)(x) = \dfrac{6x^4}{3x^3} - 6x^4 3x^3$

19.) (2 pts) Given $f(x) = -6x + 5$ and $g(x) = -x^2 - 2$, evaluate $(f \circ g)(4) = f[g(4)]$

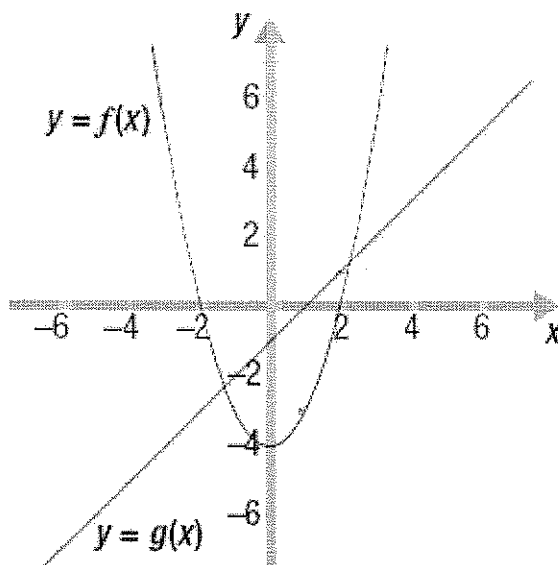$g(4) = -16 - 2 = -18$

$f(g(4)) = f(-18) = -6(-18) + 5 = 113$

Solution: ___113___

20.) (2 pts) The graphs of $y = f(x)$ and $y = g(x)$ are given. Use these graphs to find $(f \circ g)(2) = f[g(2)]$

$g(2) = 1$

$f(g(2)) = f(1) = -3$

Solution: ___-3___

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