Prem

Name: Key
Recitation Instructor, Day, Time:

TRADITIONAL MATH 100 – Exam 2 – March 2016

Directions: You will find 15 problems listed below. No notes/books/friends are allowed. Graphing calculator models above the level of a TI-84 plus are not allowed. You have one hour to complete this exam.

Page 1 20 pts.	Page 2 20 pts.	Page 3 20 pts.	Page 4 20 pts.	Page 5 20 pts	TOTAL 100 pts

1. (6 points) Find the solutions and check your answers: $8 - 2|x+15| = -18$.

$-2|x+15| = -26.$

$|x+15| = 13$

$x+15 = 13$ or $x+15 = -13$

$\boxed{x = -2 \quad \text{or} \quad x = -28}$

Check $x = -2$: $8-2|-2+15| = 8-2(13) = -18$ ✓

Check $x = -28$: $8-2|-28+15| = 8-2(13) = -18$ ✓

2. (6 points) Find the solutions to $2x^2 - x - 9 = 0$.

$a = 2$
$b = -1$
$c = -9$

$x = \dfrac{1 \pm \sqrt{1-4(2)(-9)}}{2(2)}$

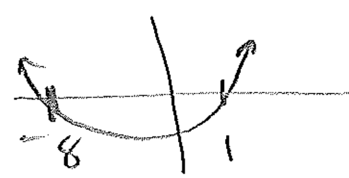
$\boxed{x = \dfrac{1 \pm \sqrt{73}}{4}}$

3. (8 points) Solve the quadratic inequality $x^2 + 7x > 8$.

$x^2 + 7x - 8 > 0$

$(x+8)(x-1) > 0$

$\boxed{(-\infty, -8) \cup (1, \infty)}$



(number line method is fine)

Nethali

4. (8 points) In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 1 mg, and grows to 9 mg over a 48 hour time period. Find a linear model (in other words, find a linear function) that describes the growth of the organism for $0 \le t \le 48$ hours.

$$\frac{9-1}{48-0} = \frac{8}{48} = \frac{1}{6}$$

$$\boxed{f(t) = \frac{1}{6}t + 1}$$

5. (6 points) Find an equation of the line passing through $(9, -1)$ and parallel to $x + 3y = 2$.

$$3y = -x + 2$$
$$y = \frac{-1}{3}x + \frac{2}{3}$$

New line: $y - (-1) = \frac{-1}{3}(x - 9)$

or $y = -\frac{1}{3}x + 2$

6. (6 points) Find the quotient and remainder when $p(x) = 2x^3 - x + 3$ is divided by $x^2 + x - 5$. Write $p(x)$ in the form $d(x)q(x) + r(x)$, where $d(x), q(x)$ and $r(x)$ are the divisor, quotient and remainder, respectively.

$$\begin{array}{r|l} & 2x - 2 \\ x^2 + x - 5 & 2x^3 + 0x^2 - x + 3 \\ & -(2x^3 + 2x^2 - 10x) \\ & -2x^2 + 9x + 3 \\ & -(-2x^2 - 2x + 10) \\ & 11x - 7 \end{array}$$

$$p(x) = \underbrace{(x^2 + x - 5)}_{d(x)}\underbrace{(2x - 2)}_{q(x)} + \underbrace{(11x - 7)}_{r(x)}$$

Bret.

7. (5 points) Suppose the number of vehicle thefts in a given area, from the years 1960 to 1990, could be modeled by the polynomial $p(x) = 30.97x^3 - 1266.9x^2 + 19199x + 29,130$, where x is the number of years since 1960. What is $p(1)$, and what is its meaning in context of the model? Explain in a brief sentence.

$p(1) = 30.97 - 1266.9 + 19199 + 29130$

$= 47093.07$

In 1961 there were approx 47093 thefts.

8. (5 points) Find the vertex of the quadratic function $C(x) = x^2 - 200x + 1200$. Is the vertex a maximum or minimum, and how do you know?

$h = \frac{200}{2(1)} = 100$

$k = C(100) = 100^2 - 200(100) + 1200 = -8800$

vertex: $(100, -8800)$.

Minimum since $a > 0$ (a is coefficient of x^2)

9. (10 points) Consider the polynomial $p(x) = -4x^3 - 12x^2 + 2x + 400$. Circle TRUE or FALSE for each of the statements below.

(a) TRUE FALSE $p(x)$ has odd degree.

(b) TRUE FALSE $p(x)$ has a negative y-intercept.

(c) TRUE FALSE $p(x)$ has positive leading coefficient.

(d) TRUE FALSE As $x \to \infty$, $p(x) \to \infty$.

(e) TRUE FALSE As $x \to -\infty$, $p(x) \to \infty$.

Horace.

10. (8 points) A parabola has vertex at $(7, 2)$ and passes through the point $(4, 1)$. What is the equation of the parabola? Write your answer in the form $y = ax^2 + bx + c$.

$y = a(x-h)^2 + k$

$1 = a(4-7)^2 + 2$

$1 = a(9) + 2$

$-1 = a(9)$

$a = -\frac{1}{9}$

$y = -\frac{1}{9}(x-7)^2 + 2.$

$y = -\frac{1}{9}(x^2 - 14x + 49) + 2$

$= -\frac{1}{9}x^2 + \frac{14}{9}x - \frac{31}{9}$

11. (6 points) Using the **REMAINDER THEOREM**, find $p(-1)$ when $p(x) = 2x^4 + x^2 - 3x + 4$. Be sure to identify your final answer.

-1	2	0	1	-3	4
	$\downarrow$	-2	2	-3	6
	2	-2	3	-6	10

$\boxed{p(-1) = 10}$

12. (6 points) Consider two quadratic functions given by $f(x) = 2x^2 - 11x + 12$ and $g(x) = x^2 - 3x + 5$. Find the intersection points of these two parabolas and state your answers as ordered pairs.

$2x^2 - 11x + 12 = x^2 - 3x + 5$

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

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

$x = 7$ or $x = 1.$

So $y = g(7) = f(7)$
$= 33$

$y = g(1) = f(1)$
$= 3.$

$\boxed{(7, 33)}$ $\boxed{(1, 3)}$

CJ

13. (6 points) Solve: $|5x - 4| < 9$.

$-9 < 5x - 4 < 9$

$-9 < 5x - 4$ and $5x - 4 < 9$

$-5 < 5x$ and $5x < 13$

$-1 < x$ and $x < \frac{13}{5}$

$\boxed{-1 < x < \frac{13}{5}}$

14. (6 points) Solve: $|3x - 1| > 6$.

$3x - 1 > 6$ or $3x - 1 < -6$

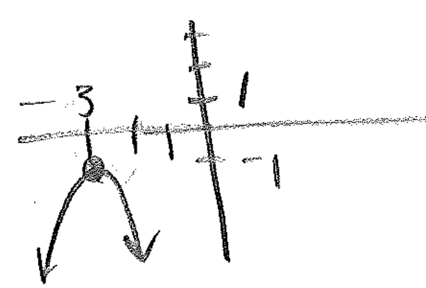
$3x > 7$ or $3x < -5$

$\boxed{x > \frac{7}{3} \text{ or } x < -\frac{5}{3}}$

15. (8 points) Consider the parabola $f(x) = -(x+3)^2 - 1$. Answer the following questions. (Drawing a quick sketch of the graph of $f(x)$ may help you.)

(a) What is the domain of $f(x)$?

All Reals.



(b) What is the vertex of $f(x)$?

$(-3, -1)$

(c) What is the range of $f(x)$?

$(-\infty, -1]$

(d) What is the axis of symmetry of $f(x)$?

$x = -3$