MATH 25 MIDTERM 1 October 1, 2015

Name: KEY Score: _____ / 100

Student ID: _____

DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO

	1	2	3	4	5	6	Total
✓							
Score							

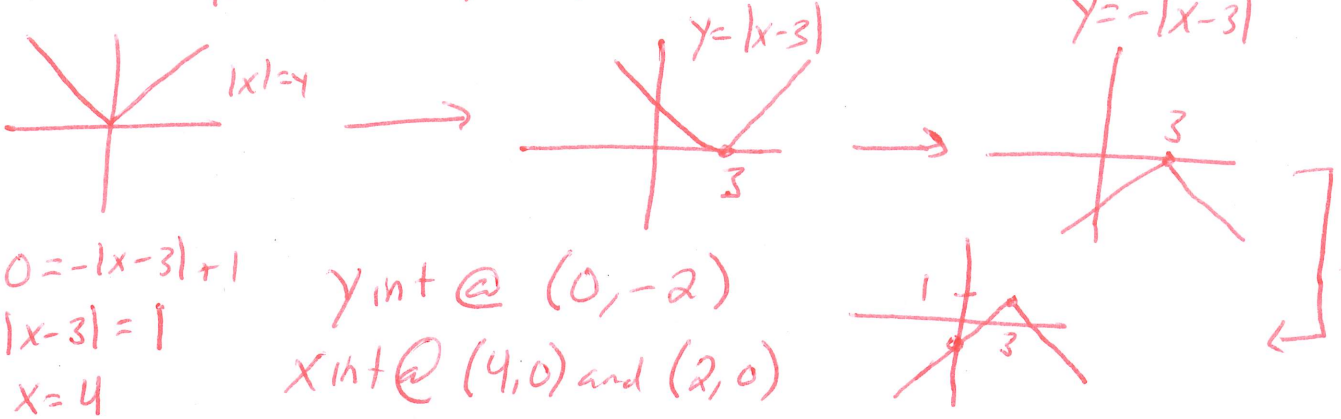
INSTRUCTIONS FOR STUDENTS

- Questions are on both sides of the paper. This is an 5 question exam (One extra credit problem can be attempted for a total of 6 questions).
- Students have 50 minutes to complete the exam.
- **PLEASE SHOW ALL WORK**. Any unjustified claims will receive no credit. Clearly box your final answer.
- You **MUST** complete **5** problems for credit. In the above table in the row with the ✓, please mark with a ✓ which problems you want to be graded. If you wish to do a 6^{th} problem for extra credit, please write *EC* in the ✓ row for the problem you wish to be counted for extra credit.
- No notes, textbooks, phones, calculators, etc. are allowed for the exam.
- Each of the 5 questions you choose to do will be graded out of 4 points. The score will then be totaled and multiplied by 5 to get a raw score out of 100 points. If you choose to do a 6^{th} problem for extra credit, the most that will be awarded for that question will be 3 points. So, the highest possible score on this examination is 103 points out of 100.
- The back of the test can be used for scratch work.

GOOD LUCK!

1) Use graph transformations to sketch the graph of $f(x) = -|x-3|+1$. Label all x and y-intercepts.

Base Graph $y=|x|$



$0 = -|x-3|+1$

$|x-3| = 1$

$x = 4$

$x = 2$

y int @ $(0,-2)$

x int @ $(4,0)$ and $(2,0)$

2) Use polynomial or synthetic division to divide the polynomials: $(x^5 - 20x^3 + 30x^2 + 19x - 30) \div (x-1)$

1 | 1 0 -20 30 19 -30

↓ 1 1 -19 11 30

1 1 -19 11 30 | 0

$= x^4 + x^3 - 19x^2 + 11x + 30$

3) Identify the asymptotes of the function: $f(x) = \frac{x^2+1}{x^2-x-2}$

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

VA's @ $(x-2)(x+1)=0 \Rightarrow x=2, x=-1$

HA's @ $y=1$ since $\lim_{x\to\infty} \frac{x^2+1}{x^2-x-2} = 1 = y$

↑ coeffs

4) Find the difference quotient $\frac{f(x+h)-f(x)}{h}$ for the function $f(x) = x^2 + 1$, and reduce completely.

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

$$= \frac{2xh+h^2}{h}$$

$$= \boxed{2x+h}$$

5) Write the inverse function, $f^{-1}(x)$, for $f(x) = \sqrt{x-2}$, and check that your result is the inverse. (Hint: Remeber the domain and range when defining the inverse.)

$y = \sqrt{x-2}$

$x = \sqrt{y-2}$

$x^2 = y-2$

inverse $\boxed{y = x^2+2 = f^{-1}(x) \text{ for } x \geq 0}$

f Domain: $[2,\infty)$

f Range: $(0,\infty)$

f^{-1} Domain: $(0,\infty)$

f^{-1} Range: $[2,\infty)$

Check

6) Solve the following equation for x: $\ln(x-4) = \ln(x+6) - \ln(x)$

$$\ln(x-4) = \ln\left(\frac{x+6}{x}\right)$$

e e

$$x-4 = \frac{x+6}{x}$$

$$x^2-4x = x+6$$

$$x^2-5x-6 = 0$$

$$(x-6)(x+1) = 0$$

$x = 6, -1$ -1 doesn't work

$\boxed{x = 6}$

THIS PAGE IS LEFT BLANK FOR ANY SCRATCH WORK

END OF TEST