MATH115 PRECALCULUS 100pts TEST 3 FALL 2011 INSTRUCTOR: C. MORRIS
p.1 NAME: Key

6pts 1. If $f(x) = -2(x-3)^2 - 4$ determine the axis of symmetry, the vertex, and what the maximum/minimum value of the function is. (Make sure to state if it has a max or min).

max value -4 $V(3,-4)$
axis $x=3$

6pts 2. Two positive numbers add up to 16. Find the numbers so that the sum of their squares is a minimum.

x
$16-x$

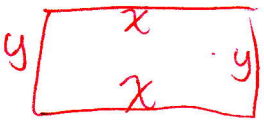
$S(x) = x^2 + (16-x)^2$

$S(x) = 2x^2 - 32x + 256$

$x = \frac{-(-32)}{2(2)} = 8$ $\quad 16 - x = 8$

The numbers are 8 and 8

6pts 3. Suppose a farmer has 300 feet of fencing to make a rectangular garden. Find the maximum garden area.

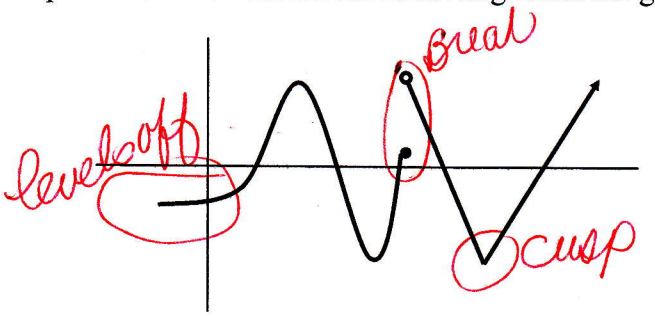


$2x+2y=300$
$x+y=150$
$y=150-x$

$A(x) = x(150-x) = 150x - x^2$

$\frac{-(150)^2 + 4(-1)(0)}{4(-1)} =$ 5625 sq ft max area

6pts 4. Give 3 reasons the following is not the graph of a polynomial



6pts 5. Graph $y = \frac{4}{x^2}$ see graph paper

6pts 6. Graph $y = x^3 - x$ See graph paper

6pts 7. Graph $y = \frac{x^2}{x^2 - 4}$ See graph paper

6pts 8. Solve using the critical point method (write solution with interval notation)

$(2x-3)(x+5)(x-3) > 0$

$x = 3/2$
-5
3

$2x-3$
$x+5$
$x-3$

	-5		$3/2$		3	
$2x-3$	$-$	$-$	$-$	$+$	$+$	$+$
$x+5$	$-$	$+$	$+$	$+$	$+$	$+$
$x-3$	$-$	$-$	$-$	$-$	$+$	$+$
	$-$	$+$	$-$	$+$	$-$	$+$

$(-5, 3/2) \cup (3, \infty)$

6pts 9. Solve using the critical point method (write solution with interval notation)

$$\frac{x^2-7x+12}{x+5} \le 0$$

$\frac{(x-3)(x-4)}{x+5}$

	$(-\infty,-5)$	$(-5,3)$	$(3,4)$	$(4,\infty)$
$x-3$	$-$	$-$	$+$	$+$
$x-4$	$-$	$-$	$-$	$+$
$x+5$	$-$	$+$	$+$	$+$
	$-$	$+$	$-$	$+$

$(-\infty,-5) \cup [3,4]$

6pts 10. Graph $y = (3)^{-x}$ see graph paper

6pts 11. How much interest is earned when \$250,000 is compounded quarterly at 4% for nine years?

$250000\left(1+\frac{.04}{4}\right)^{4\cdot 9} - 250000$

$250{,}000(1.01)^{36} - 250{,}000$

$357{,}692.20 - 250{,}000$

interest \$107,692.20

6pts 12. Which is worth more? \$225,000 compounded annually at 2% for twelve years or \$250,000 compounded continuously at 3% for five years?

$225{,}000(1.02)^{12}$

285,354.40

$250{,}000e^{.15}$

290,458.56 worth more

5pts 13. Write as a logarithm $2^6 = 64$

$\log_2 64 = 6$

5pts 14. Solve for x: $\log_2 128 = x$

$2^x = 128 \quad 2^x = 2^7 \quad x = 7$

6pts 15. Solve for x: $x^2e^x - 19xe^x + 48e^x = 0$

$(x^2-19x+48)e^x = 0$

$(x-16)(x-3)(e^x) = 0$

$e^x \neq 0$

$x = 16 \text{ or } 3$

Math 115 Test 3 Fall 2011

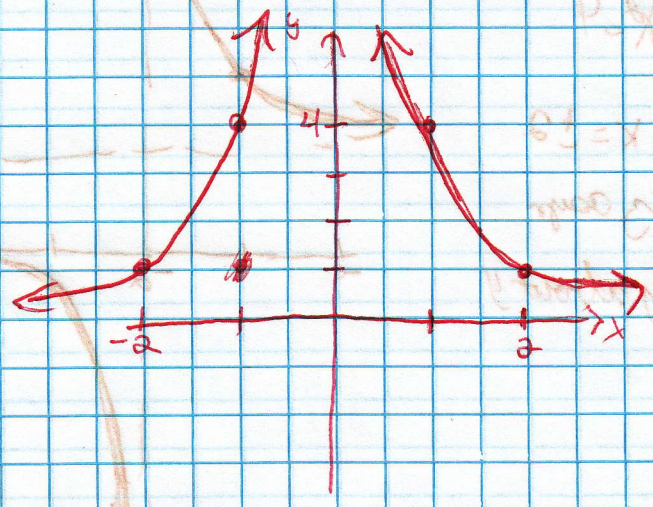
6pts

⑤ $y = 4/x^2$

vert asymp
$x = 0$

horiz $y = 0$

no x, y inters



6pts

⑥ $y = \dfrac{x^3 - x}{x(x-1)(x+1)}$

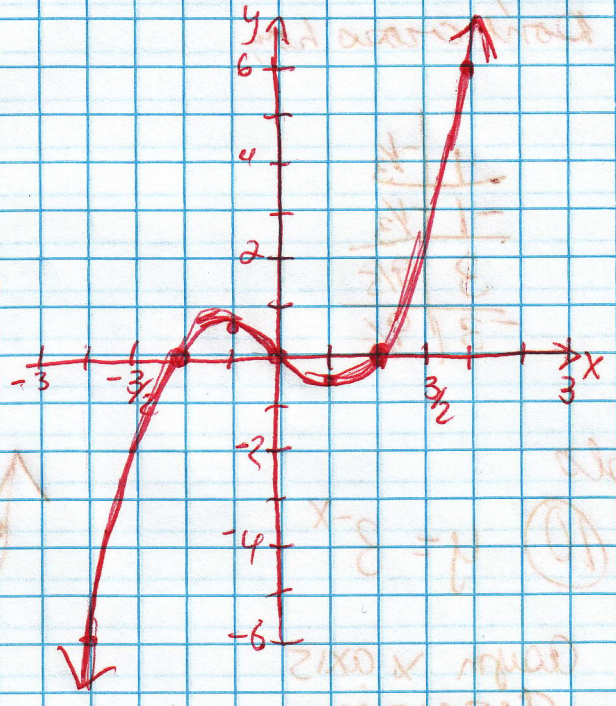
x intercepts $0, 1, -1$

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

near 1 $(1)(x-1)(2)$
$2(x-1)$

near -1 $(-1)(-2)(x+1)$
$2(x+1)$

x, y inters $(0,0)$



x	y
1/2	-3/8
-1/2	3/8
2	6
-2	-6

9 pts

⑨ $y = \frac{x^2}{x^2-4}$

Vert asym $x = \pm 2$

$y = 1$ horiz asym

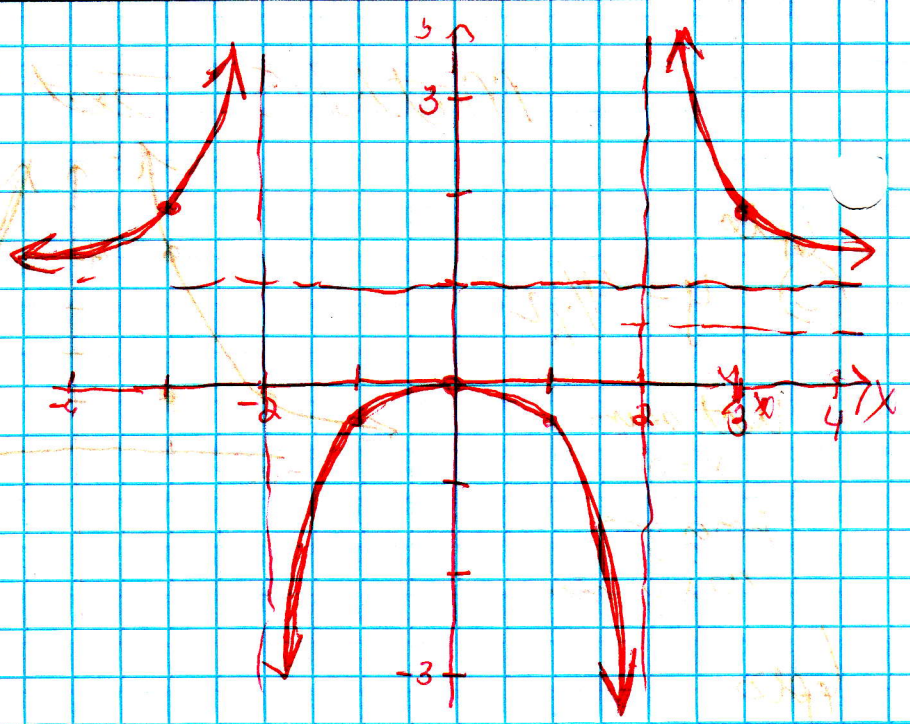
Symmetry about y

$1 = \frac{x^2}{x^2-4}$

$x^2 - 4 \neq x^2$

Dont cross horiz

1	$-\frac{1}{3}$
−1	$-\frac{1}{3}$
3	$\frac{9}{5}$
−3	$\frac{9}{5}$



6 pts

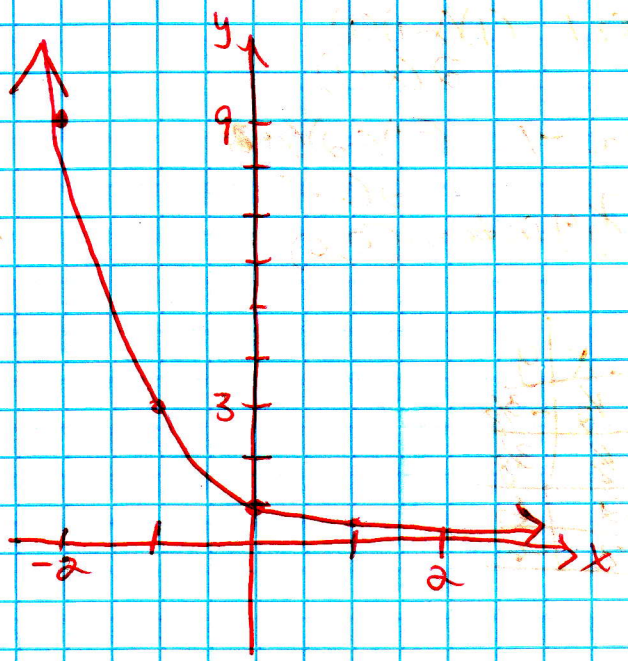
⑩ $y = 3^{-x}$

asym x axis

decreasing

y int 1

−2	9
−1	3
0	1
1	$\frac{1}{3}$
2	$\frac{1}{9}$



6pts 16. Write as a single logarithm: $3\log_5(x-5) - 4\log_5(y+1) + 2\log_5(z+3)$

$\log_5(x-5)^3 - \log_5(y+1)^4 + \log_5(z+3)^2$

$\log_5\left[\frac{(x-5)^3(z+3)^2}{(y+1)^4}\right]$

6pts 17. Solve $\log_4(x+11) + \log_4(x-4) = 2$

$\log_4(x+11)(x-4) = 2$

$4^2 = x^2 + 7x - 44$

$x^2 + 7x - 60 = 0$

$(x-5)(x+12) = 0$

$x = 5$ or ~~$x = -12$~~

6pts 18. Suppose $A = (257.4)e^{0.058t}$ represents the population of a city in thousands t years after the year 2010. What is the expected population for the city in 2040 if the model is correct?

$257.4\,e^{.058(30)}$

$257.4\,e^{1.74}$

1466.496 thousand

Some formulas you may need

1. $y = mx + b$
2. $(x - h)^2 + (y - k)^2 = r^2$
3. $y - y_1 = m(x - x_1)$
4. $m = \frac{y_2 - y_1}{x_2 - x_1}$
5. $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
6. $x^2 + y^2 = r^2$
7. $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
8. $2r = d$
9. $A = LW$
10. $x = -b/2a$
11. $I = Prt$
12. $A = P(1 + r/n)^{nt}$
13. $A = Pe^{rt}$
14. $A = P(1 + r)^t$
15. $\left(\frac{-b}{2a}, \frac{-b^2 + 4ac}{4a}\right)$
16. $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
17. $P = 2L + 2W$