MA 110 — Precalculus Fall 2014
Exam 3 18 November 2014

Name: _____

Section: _____

Last 4 digits of student ID #: _____

This exam has ten multiple choice questions (four points each) and five free response questions (seven points each). Additional blank sheets are available if necessary for scratch work. No books or notes may be used. Turn off your cell phones and do not wear ear-plugs during the exam. You may use a calculator, but not one which has symbolic manipulation capabilities.

On the multiple choice problems:

1. You must give your *final answers* in the *multiple choice answer box* on the front page of your exam.
2. Carefully check your answers. No credit will be given for answers other than those indicated on the *multiple choice answer box*.

On the free response problems:

1. Clearly indicate your answer and the reasoning used to arrive at that answer *(unsupported answers may not receive credit)*,
2. Give exact answers, rather than decimal approximations to the answer (unless otherwise stated).

Each free response question is followed by space to write your answer. Please write your solutions neatly in the space below the question. You are not expected to write your solution next to the statement of the question.

Multiple Choice Answers

Question					
1	A	B	C	D	**E**
2	**A**	B	C	D	E
3	A	B	**C**	D	E
4	A	B	C	**D**	E
5	A	B	C	**D**	E
6	A	B	C	D	**E**
7	**A**	B	C	D	E
8	**A**	B	C	D	E
9	A	**B**	C	D	E
10	A	B	**C**	D	E

Exam Scores

Question	Score	Total
MC		40
11		7
12		7
13		7
14		7
15		7
Webassign Score		75
Percentage		100

Record the correct answer to the following problem on the front page of this exam.

(1) Describe the end behavior of the graph of

$$f(x) = \frac{3x^4 - 2x^3 + 2x - 1}{5x^4 - x + 10}$$

as $x \to \infty$.

A) $y \to \infty$

B) $y \to -\infty$

C) $y \to 0$

D) $y \to -\frac{1}{10}$

E) $y \to \frac{3}{5}$

degree denominator = 4
degree numerator = 4

$x \to \infty \quad y \to \frac{3x^4}{5x^4} = \frac{3}{5}$

(2) If the number of bacteria in a population doubles every 2 hours, how many bacteria will be present in 5 hours if the original number of bacteria is 1000? Round answer to the nearest integer.

A) 5657

B) 32000

C) The number cannot be determined without the growth rate.

D) 12182

E) 3219

t	P
0	1000
2	2000
5	4000

$P = 1000\left(2^{t/2}\right)$

$= 1000\left(2^{5/2}\right)$

$= 5657$

(3) Find the domain of $f(x) = \ln(x^2 - 2x - 3)$.

A) $(-\infty, \infty)$

B) $(0, \infty)$

C) $(-\infty, -1) \cup (3, \infty)$

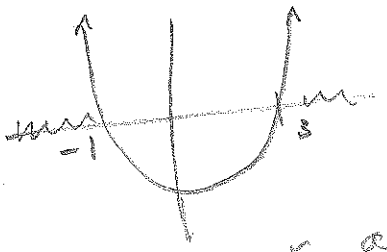
D) $[-1, 3]$

E) $(-1, 3)$

$x^2 - 2x - 3 > 0$

$(x-3)(x+1) > 0$

$x = 3 \quad x = -1$



graph above x axis when $(-\infty, -1) \cup (3, \infty)$

Record the correct answer to the following problem on the front page of this exam.

(4) Simplify $e^{2\ln(x-1)}$.

A) $2(x-1)$
B) $2x-2$
C) x^2
D) $(x-1)^2$
E) x^2-2

$= e^{\ln(x-1)^2}$

$= (x-1)^2$

(5) Solve for x

$\sqrt{x+5} = x-1$

A) There is no solution.
B) $x=4$ and $x=-1$.
C) $x=1$ only.
D) $x=4$ only.
E) $x=-1$ only.

$(\sqrt{x+5})^2 = (x-1)^2$

$x+5 = x^2-2x+1$

$0 = x^2-3x-4$

$0 = (x-4)(x+1)$

$x=4, \quad x=-1$

check answer: $x=-1$ doesn't

(6) Solve for x.

$x^2-5x=14$

A) $x=-7$ and $x=2$.
B) $x=7$ only.
C) The equation has no real solutions.
D) $x=\sqrt{14+5x}$
E) $x=-2$ and $x=7$.

$x^2-5x-14=0$

$(x-7)(x+2)=0$

$x=7, \quad x=-2$

Record the correct answer to the following problem on the front page of this exam.

(7) Solve the inequality

$$|2x - 5| > 7.$$

A) $(-\infty, -1) \cup (6, \infty)$

B) The inequality has no solution.

C) $[-1, \infty)$

D) $[-1, 6]$

E) $(-\infty, 6]$

$2x - 5 > 7$ $\quad$ $2x - 5 < -7$

$2x > 12$ $\quad$ $2x < -2$

$x > 6$ $\quad$ $x < -1$

$(-\infty, -1) \cup (6, \infty)$

(8) Find the amount in a bank account after two years if \$2500 is initially deposited at an interest rate of 3.2% compounded monthly. Round your answer to the nearest cent.

A) \$2665.00

B) \$2665.23

C) \$7296.70

D) \$2662.56

E) \$3648.35

$n = 12, \quad r = .032, \quad t = 2$

$2500\left(1 + \frac{.032}{12}\right)^{2(12)} = 2665.00$

(9) Solve for x exactly.

$$e^{2x+5} = 27$$

A) $e^{27} - 5/2$

B) $\dfrac{\ln(27) - 5}{2}$

C) $\dfrac{\log(22)}{2}$

D) 11

E) 10.52

$\ln\left(e^{2x+5}\right) = \ln(27)$

$2x + 3 = \ln(27)$

$2x = \ln(27) - 3$

$x = \dfrac{\ln(27) - 3}{2}$

Record the correct answer to the following problem on the front page of this exam.

(10) Which statement describes the graph of

$$f(x) = \frac{x^2 - 3x + 2}{x^2 - 1} \ ?$$

A) The graph has a hole at $x = -1$ and no horizontal asymptote.

B) The graph has no horizontal or vertical asymptotes, nor any holes.

C) The graph has a hole at $x = 1$ and a vertical asymptote of $x = -1$.

D) The graph has a hole at $x = -1$ and a horizontal asymptote of $y = 1$.

E) The graph has horizontal asymptotes at $x = -1$ and $x = 1$.

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

vert asymp $x = -1$

$x \to \infty$ $y \to 1$

$y = 1$ horizontal asymptote

Some Useful Formulas

$$B(t) = P\,(1 + r)^t$$

$$B(t) = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$P(t) = P_0 e^{rt}$$

$$Q(t) = Q_0 e^{-rt}$$

Free Response Questions: Show your work!

(11) Write the expression in terms of a single logarithm.

$$\log(x^2-1) - 2\log(x+3) + \frac{1}{2}\log(x)$$

$\log(x^2-1) - \log(x+3)^2 + \log(x^{1/2})$

$\log\frac{(x^2-1)}{(x+3)^2} + \log(x^{1/2})$

$\log\left(\frac{(x^2-1)(x^{1/2})}{(x+3)^2}\right)$

Free Response Questions: Show your work!

(12) Solve the inequality exactly. Show all work. Do not use a graphing calculator to get the answer.

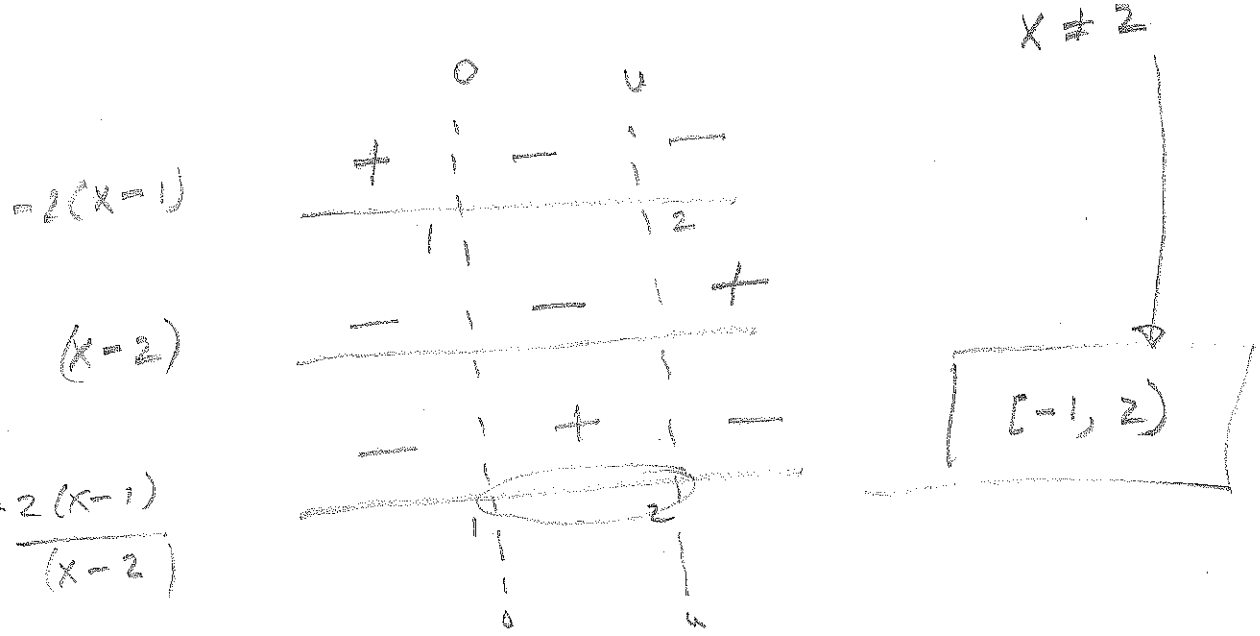
$$\frac{x-4}{x-2} \geq 3$$

$$\frac{x-4}{x-2} - 3 \geq 0$$

$$\frac{x-4-3(x-2)}{x-2} \geq 0$$

$$\frac{-2x+2}{x-2} = \frac{-2(x-1)}{x-2} \geq 0$$

$x \neq 2$



Free Response Questions: Show your work!

(13) Find the time it takes for an investment to triple if it is put into an account with a 6.2% interest rate compounded continuously. Solve algebraically and show all work.

Free Response Questions: Show your work!

(14) Solve for x exactly. Show all work. Do not use graphical techniques.

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

$x^4 - x^2 - 6 = 0$

$u = x^2$

$u^2 = x^4$

$u^2 - u - 6 = 0$

$(u-3)(u+2) = 0$

$u = 3$

$x^2 = 3$

$x = \pm\sqrt{3}$

$u = -2$

$x^2 = -2$

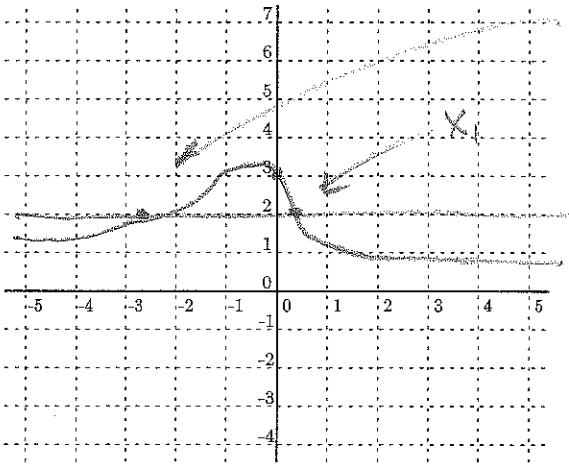
no solution

$-\sqrt{3}, \sqrt{3}$

Free Response Questions: Show your work!

(15) Use a graphing calculator to find the approximate solutions to the inequality. Sketch the graph or graphs that you are using to solve the problem. The answer should be accurate to three decimal places. Express your answer in interval notation.

$$\left|\frac{x^2-2x+6}{x^2+2}\right| > 2$$



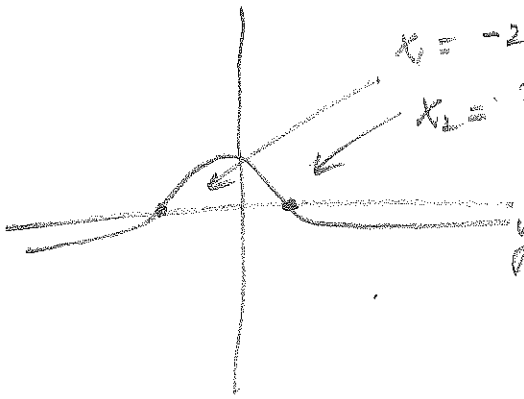
$y > y_1$ when x in

$(-2.732, 0.732)$

or

intercept

$$y = \left|\frac{x^2-2x+6}{x^2+2}\right| - 2 > 0$$



$y > 0$

$y_1 > 0$

when x in

$(-2.732, 0.732)$