Ma 110 — Precalculus   Spring 2015
Exam 1   10 January 2015

Name: _Answers?_

Section: _____

Last 4 digits of student ID #: _____

This exam has ten multiple choice questions
(four points each) and five free response ques-
tions (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 rea-
   soning used to arrive at that answer *(un-
   supported answers may not receive credit)*,

2. Give exact answers, rather than decimal
   approximations to the answer (unless oth-
   erwise stated).

Each free response question is followed by
space to write your answer. Please write your
solutions neatly in the space below the ques-
tion. You are not expected to write your so-
lution 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) Simplify and express answer exactly.

$$\sqrt{36} + \sqrt{5}$$

A) $\sqrt{30}$

B) $\sqrt{41}$

C) 8.236

D) $6\sqrt{5}$

E) None of the answers above are the simplified expression.

$\sqrt{36} + \sqrt{5} = 6 + \sqrt{5}$.

(2) Express the given geometric statement x is less than a distance of 5 units from 6 on the number line using absolute values.

A) $|x - 6| < 5$

B) $|x - 6| > 5$

C) $|x - 5| < 6$

D) $|x + 5| \leq 6$

E) $|5 - 6| \geq x$

(3) Find the distance on the number line between $\dfrac{3}{5}$ and $-\sqrt{2}$ exactly.

A) $\left|\dfrac{3}{5} - \sqrt{2}\right|$

B) $\dfrac{3}{5} + \sqrt{2}$

C) $\left|\sqrt{2} - \dfrac{3}{5}\right|$

D) $\dfrac{3 - \sqrt{2}}{5}$

E) None of the above expressions are the correct distance.

$\left|\dfrac{3}{5} - -\sqrt{2}\right| = \left|\dfrac{3}{5} + \sqrt{2}\right|$

$= \dfrac{3}{5} + \sqrt{2}$

Since $\dfrac{3}{5} + \sqrt{2} > 0$.

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(4) Simplify the expression and express in standard complex form.

$$(2+i)(2-i)$$

A) $3 + 0i$

B) $5i$

C) $4 + i$

D) $5 + 0i$

E) $2 - i$

Handwritten: $(2+i)(2-i) = 2^2 - i^2 = 4 - -1 = 5.$

(5) State the domain of the function

$$f(x) = \sqrt{x - 4}.$$

A) $(4, \infty)$

B) $x \neq 4$

C) $(-\infty, \infty)$.

D) $[4, \infty)$

E) $(-\infty, 4)$

Handwritten: $x - 4 \geq 0$ or $x \geq 4$

The domain is $[4, \infty)$.

(6) Simplify the expression and write the answer using exponents. (You may assume that $t \geq 0$)

$$\sqrt[6]{t^3}\sqrt{25t^5}$$

A) $25t^3$

B) The expression can not be simplified.

C) $5t^{9/2}$

D) $5t^3$

E) $5t^{8/15}$

Handwritten: $\sqrt[6]{t^3}\sqrt{25t^5} = t^{3/6} \cdot 25^{\frac{1}{2}}t^{5/2}$

$= 5 \cdot t^{1/2} \cdot t^{5/2} = 5t^3$

(7) Find the distance in the Cartesian plane between the two points $(1, -4)$ and $(3, -9)$.

A) $\sqrt{41}$

B) $\sqrt{185}$

C) $\sqrt{45}$

D) 9

E) $\sqrt{29}$

$$\sqrt{(1-3)^2 + (-4--9)^2} = \sqrt{(-2)^2 + 5^2}$$

$$= \sqrt{29}.$$

(8) Which one of the following expression is equivalent to the expression

$$(\sqrt{x} - a)^2$$

(You may assume $x \geq 0$)

A) $x - 2a\sqrt{x} + a^2$

B) $x + a$

C) $x - a^2$

D) xa^2

E) $x - a$

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

$$= x - 2a\sqrt{x} + a^2.$$

(9) Find $f(-1)$ for

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

A) 1

B) $f(x)$ is undefined for $x = -1$.

C) -2

D) 0

E) 2

$f(-1)$ is undefined since the denominator $x + 1 = 0$ of $x = -1$

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(10) Which one of the following statements is true for all real numbers a and b?

A) $\dfrac{a}{a} = 1$

B) $|a^2| = -\sqrt{a}$ for $a < 0$.

C) $\sqrt{a^2} = |a|$

D) $|-a| = a$

E) $\sqrt{a^2 + b^2} = a + b$

A fails if $a = 0$

B fails for many reasons.
For example $\sqrt{a}$ is undefined
if $a < 0$.

D) fails if $a < 0$.

E) fails if $a = b = 1$,
$\sqrt{1^2 + 1^2} = \sqrt{2}$ and $|1 + 1| = 2$
but $\sqrt{2} \neq 2$.

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(11) Find the center and radius of the circle by completing the square. (Hint: The equation is in fact a circle!)

$$x^2 + 8x + y^2 - 2y + 5 = 0$$

Show all necessary steps!

Complete the squares

$$x^2 + 8x + 16 + y^2 - 2y + 1 = -5 + 16 + 1$$

$$(x+4)^2 + (y-1)^2 = 12.$$

$$(x - -4)^2 + (y-1) = (\sqrt{12})^2$$

The set of points (x, y) satisfying this equation is the set of points (x, y) at distance $\sqrt{12}$ from $(-4, 1)$.

(12) Find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$ for the function $f(x) = x^2 + 3x + 1$ and simplify the result.

$$\frac{f(x+h) - f(x)}{h}$$

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

Expand square

$$= \frac{x^2 + 2xh + h^2 + 3x + 3h + 1 - x^2 - 3x - 1}{h}$$

Cancel

$$= \frac{2xh + h^2 + 3h}{h}$$

$$= 2x + h + 3$$

$$= 2x + 3 + h.$$

(13) Find the equation of the line through $(4, -3)$ and parallel to the line $2x + 3y - 6 = 0$.

$$2x + 3y - 6 = 0.$$

$$3y = -2x + 6$$

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

The line $2x + 3y - 6 = 0$ has slope $-2/3$.

We want the line thru $(4, -3)$

with slope $-2/3$

$$y - 3 = -\frac{2}{3}(x - 4).$$

$$y + 3 = -\frac{2}{3}x + \frac{8}{3}$$

$$y = -\frac{2}{3}x + \frac{8}{3} - \frac{3}{3}$$

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

(14) Solve the quadratic equation and express the answer in standard complex form.

$$x^2 + 2x + 5 = 0$$

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

$$(x+1)^2 = -4$$

$$x + 1 = \pm\sqrt{-4}$$

$$= \pm 2i$$

$$x = -1 \pm 2i$$

(15) Sketch the graph of $f(x) = |x + 1|$ and state the domain and range.