

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	<input checked="" type="radio"/>	B	C	D	E
2	<input checked="" type="radio"/>	B	C	D	E
3	A	B	<input checked="" type="radio"/>	D	E
4	A	B	C	D	<input checked="" type="radio"/>
5	A	B	C	<input checked="" type="radio"/>	E
6	A	B	C	D	<input checked="" type="radio"/>
7	A	<input checked="" type="radio"/>	C	D	E
8	A	B	C	<input checked="" type="radio"/>	E
9	A	<input checked="" type="radio"/>	C	D	E
10	A	B	C	D	<input checked="" type="radio"/>

**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.

A)  $3\sqrt{3}$

B)  $6\sqrt{3}$

C) 5.1962

D)  $\sqrt{45}$

E) The expression can not be simplified.

$$\sqrt{48} - \sqrt{3}$$

$$\sqrt{16 \cdot 3} - \sqrt{3}$$

$$\sqrt{16} \sqrt{3} - \sqrt{3}$$

$$4\sqrt{3} - \sqrt{3} = 3\sqrt{3}$$

(2) Express the given geometric statement  $x$  is at most a distance of 8 units from  $c$  on the number line using absolute values.

A)  $|x - c| \leq 8$

B)  $|x - c| < 8$

C)  $|x - 8| > c$

D)  $|x + c| \leq 8$

E)  $|8 + c| \geq x$

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

A)  $\frac{-2}{5} - \pi$

B)  $\frac{2}{5} + \pi$

C)  $\pi - \frac{2}{5}$

D)  $\frac{2 - \pi}{5}$

E) The distance between two negative points is undefined.

$$\left| -\frac{2}{5} - (-\pi) \right|$$

$$= \left| -\frac{2}{5} + \pi \right| = \pi - \frac{2}{5}$$

$$\left( \pi > -\frac{2}{5} \right)$$

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

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

A)  $10 + 0i$   
 B)  $10 + 3i$   
 C)  $9 - i^2$   
 D)  $9i$   
 (E)  $8 - 6i$

$$(3-i)^2$$

$$(3-i)(3-i)$$

$$9 - 3i - 3i + (i)^2$$

$$9 - 6i - 1$$

$$8 - 6i$$

$i^2 = -1$

- (5) State the domain of the function

A)  $[-3, \infty)$   
 B)  $x \neq 3$   
 C)  $(-\infty, \infty)$   
 (D)  $(3, \infty)$   
 E)  $(-\infty, 3)$

$$f(x) = \frac{1}{\sqrt{x-3}}$$

$x - 3 \geq 0$  and  $x \neq 3$   
 $x \geq 3$

$x > 3$   
 $(3, \infty)$

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

A)  $5t^{12/2}$   
 B)  $25t^{6/7}$   
 C) The expression can not be simplified.  
 D)  $5t^{6/8}$   
 (E)  $5t^{37/14}$

$$\sqrt[7]{t} \sqrt{25t^5}$$

$$\sqrt{25} t^{1/7} t^{5/2}$$

$$= 5 t^{1/7 + 5/2}$$

$$= 5 t^{37/14}$$

$$\frac{1}{7} + \frac{5}{2} = \frac{2 + 35}{14}$$

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

(7) Find the distance in the Cartesian plane between the two points  $(-1, 4)$  and  $(3, -8)$ .

A) 16

B)  $4\sqrt{10}$

C)  $2\sqrt{5}$

D) 20

E)  $3\sqrt{2}$

$$\sqrt{(-1-3)^2 + (4-(-8))^2}$$

$$\begin{aligned}\sqrt{(-4)^2 + 12^2} &= \sqrt{16 + 144} = \sqrt{160} \\ &= \sqrt{16} \sqrt{10} = 4\sqrt{10}\end{aligned}$$

(8) Simplify the expression. (You may assume  $x, y \geq 0$ )

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

(difference of squares)

A)  $x - 2\sqrt{xy} + y$

B)  $\sqrt{x} - \sqrt{y}$

C)  $x + y$

D)  $x - y$

E)  $\sqrt{xy}$

$$= x - y$$

(9) Find  $f(-4)$  for

$$f(x) = (x-2)^2 + (x+5)^3 - 36$$

A)  $-4(x-2)^2 - 4(x+5)^3 - 36$

B) 1

C)  $(x-2)^2 + (x+5)^3 - 40$

D) 73

E) -71

$$\begin{aligned}f(-4) &= (-4-2)^2 + (-4+5)^3 - 36 \\ &= (-6)^2 + 1^3 - 36 \\ &= 36 + 1 - 36 = 1\end{aligned}$$

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

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

A)  $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$  for  $a, b \geq 0$

B)  $\sqrt{a^2} = a$

C)  $|-a| = a$

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

E)  $|a^2 - b^2| \geq 0$

Free Response Questions: Show your work!

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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!)

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

Show all necessary steps!

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

$$-\frac{4}{2} = -2, \quad (-2)^2 = 4$$

$$\frac{6}{2} = 3, \quad 3^2 = 9$$

$$x^2 - 4x + 4 + y^2 + 6y + 9 = -4 + 4 + 9 = 9$$

$$(x-2)^2 + (y+3)^2 = 9$$

$$\text{Center} = (2, -3)$$

$$\text{radius} = \sqrt{9} = 3$$

Free Response Questions: Show your work!

- (12) Find the difference quotient  $\frac{f(x+h) - f(x)}{h}$  for the function  $f(x) = x^2 - 5$  and simplify the result.

$$\frac{(x+h)^2 - 5 - (x^2 - 5)}{h}$$

$$f(x+h) = (x+h)^2 - 5$$

$$\frac{x^2 + 2xh + h^2 - 5 - x^2 + 5}{h}$$

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

$$= 2x + h$$

Free Response Questions: Show your work!

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- (13) Find the equation of the line through  $(-4, 3)$  and parallel to the line through the points  $(5, 2)$  and  $(-1, 3)$ .

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$$\text{slope} = \frac{2-3}{5-(-1)} = \frac{-1}{6}$$

parallel so  $m = -\frac{1}{6}$

$$y - y_1 = m(x - x_1)$$

$$y - 3 = -\frac{1}{6}(x - (-4))$$

$$y - 3 = -\frac{1}{6}(x + 4)$$



Free Response Questions: Show your work!

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

$$2x^2 + 3x = -10$$

$$2x^2 + 3x + 10 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(10)}}{2(2)}$$

$$= \frac{-3 \pm \sqrt{9 - 80}}{4}$$

$$= \frac{-3 \pm \sqrt{-71}}{4} = -\frac{3}{4} \pm i \frac{\sqrt{71}}{4}$$

or

$$x = -\frac{3}{4} + \frac{\sqrt{71}}{4} i$$

$$-\frac{3}{4} - \frac{\sqrt{71}}{4} i$$

Free Response Questions: Show your work!

(15) The tables below are data collected from measurements of the motion of a particle along a straight line where the input is time, and the output is distance. Only one of the tables represents a function and the other two do not.

Table A

Input	3	-2	-3	$\pi$	3
Output	2	-2	1	2.2	-2

Table B

Input	-1	2	3	2	1
Output	1	2	-3	4	5

Table C

Input	0	2	3	1	4
Output	2	6	8	4	10

} not functions

1. Identify the table that represents a function and state the domain and range.

Table C      domain:  $\{0, 2, 3, 1, 4\}$   
 range:  $\{2, 6, 8, 4, 10\}$

2. The table from your answer in part 1 is a linear function. Find the speed of the object. The speed or rate of change is given by  $\frac{\Delta d}{\Delta t}$  where  $d$  is distance in feet (output) and  $t$  is time in seconds (input).

$$\text{Speed} = \frac{\Delta d}{\Delta t} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 2}{2 - 0} = \frac{4}{2} = 2$$

or any other two points  
 will give  $\frac{\Delta d}{\Delta t} = 2$