

Name: _____

Section: _____

Last 4 digits of student ID #: _____

This exam has eleven multiple choice questions (five points each) and five free response questions (nine 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
11	A	B	C	D	E

Exam Scores

Question	Score	Total
MC		55
12 11		9
13 12		9
14 13		9
15 14		9
16 15		9
Score		100

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

(1) Solve for x exactly

$$2(x^3 - 3) = \frac{7x^3}{5}$$

A) $\pm\sqrt[3]{10}$

B) $\sqrt[3]{-10}$

C) $\sqrt[3]{10}$

D) $\sqrt[3]{\frac{30}{17}}$

E) The equation has no real solution.

$$10(x^3 - 3) = 7x^3$$

$$10x^3 - 30 = 7x^3$$

$$3x^3 = 30$$

$$x^3 = 10$$

$$x = \sqrt[3]{10}$$

(2) Express the given geometric statement x is at most 8 units from c using absolute values.

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

B) $|x - c| < 8$

C) $|x - 8| > c$

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

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

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

(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.

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

because

$$\pi - \frac{2}{5} > 0$$

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

(4) Find $h(-1)$ for

$$-2 \leq -1 \leq 3 \quad (-1)^3 = -1 \quad h(x) = \begin{cases} x^2 - 1, & x < -2 \\ x^3, & -2 \leq x \leq 3 \\ 2x + 3, & 3 < x \end{cases}$$

A) $h(x)$ is undefined for $x = -1$.

B) 1

C) -1

D) 0

E) -2

(5) State the domain of the function

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

A) $(-\infty, 3]$

B) $x \neq 3$

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

D) $(3, \infty)$

E) $(-\infty, 3)$

$$3 - x > 0$$

$$3 > x$$

$$x < 3$$

$$(-\infty, 3)$$

(6) Find the slope of the line given by

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

A) $\frac{3}{2}$

B) -2

C) The equation is not a line.

D) The line has no slope. It is vertical.

E) $-\frac{2}{3}$

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

$$y = \left(-\frac{2}{3}\right)x - \frac{6}{3}$$

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) $3\sqrt{2}$

$$\begin{aligned}d &= \sqrt{(-1-3)^2 + (4-(-8))^2} \\&= \sqrt{(-4)^2 + (12)^2} = \\&= \sqrt{16 + 144} = \sqrt{160} = \sqrt{16 \cdot 10} \\&= \sqrt{16} \sqrt{10} \\&= 4\sqrt{10}\end{aligned}$$

(8) Which one of the statements is true for the graph of

$$t^2 = \sqrt{s^3 + 3}$$

F A) t is a function of s but s is not a function of t .

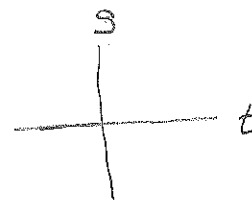
F B) The graph passes the vertical line test.

F C) The graph fails the horizontal line test.

F D) s is a function of t and t is a function of s .

T (E) s is a function of t but t is not a function of s .

$$s = \sqrt[3]{t^4 - 3}$$



(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

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

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

(10) Find all real solutions to the equation

$$4x^2 = 5x - 1.$$

- A) $x = 1$ and $x = \frac{1}{4}$.
- B) There are no real solutions.
- C) $x = 1$ only.
- D) $x = \frac{5 \pm \sqrt{34}}{8}$
- E) $x = \pm \frac{\sqrt{5x-1}}{2}$

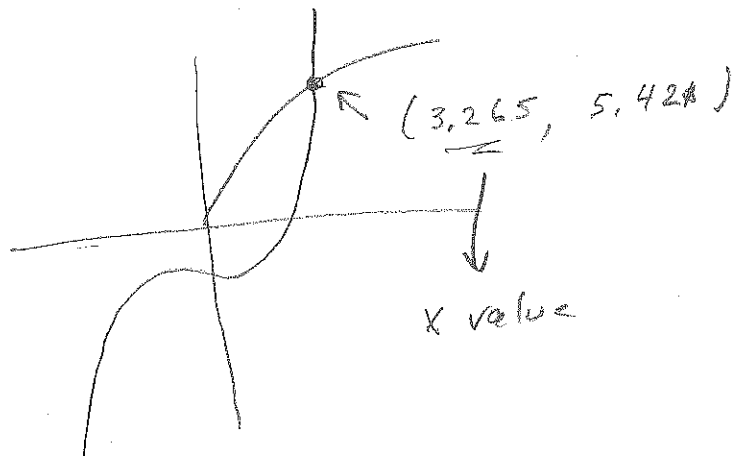
$$\begin{aligned} 4x^2 - 5x + 1 &= 0 \\ x &= \frac{5 \pm \sqrt{(-5)^2 - 4(4)(1)}}{2(4)} \\ &= \frac{5 \pm \sqrt{25 - 16}}{8} = \frac{5 \pm \sqrt{9}}{8} \end{aligned}$$

(11) Solve the equation for x to three decimal places using a graphing calculator.

$$\frac{x^5}{50} - 2 = 3\sqrt{x}.$$

$$\begin{aligned} &= \frac{5 \pm 3}{8} \\ &= \frac{8}{8}, \frac{2}{8} \end{aligned}$$

- A) 3.265
- B) 5.421
- C) 0.444
- D) The equation has no solution.
- E) 3.101



Free Response Questions: Show your work!

- (12) 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!

complete
square

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

$$\left(\frac{-4}{2}\right)^2 = 4$$

$$\left(\frac{6}{2}\right)^2 = 9$$

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

center $(2, -3)$

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

Free Response Questions: Show your work!

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

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

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

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

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

$$= 2x + h - 5$$

Free Response Questions: Show your work!

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

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

parallel so slope of line = $-\frac{1}{6}$ ^{other}

$$\boxed{y-3 = -\frac{1}{6}(x-4)} \leftarrow \text{stop here!}$$

or

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

$$y = -\frac{x}{6} + \frac{4}{6} + \frac{18}{6}$$

$$= -\frac{x}{6} + \frac{22}{6}$$

Free Response Questions: Show your work!

(15) Find $(f \circ g)(x) = f(g(x))$ for

$$f(x) = 2x^2 + 3x - 10, \quad g(x) = \frac{x}{x^2 - 1}.$$

Do not simplify your answer.

$$(f \circ g)(x) = f(g(x))$$

$$= f\left(\frac{x}{x^2 - 1}\right)$$

$$= 2\left(\frac{x}{x^2 - 1}\right)^2 + 3\left(\frac{x}{x^2 - 1}\right) - 10$$

Free Response Questions: Show your work!

(16) Solve the equation for x

$$\frac{x+2}{x-3} - \frac{7}{x+3} = \frac{30}{x^2-9}$$

l.c.d. = $(x-3)(x+3)$

$$\frac{x+2}{x-3} - \frac{7}{x+3} = \frac{30}{(x-3)(x+3)}$$

$$(x-3)(x+3) \left(\frac{x+2}{x-3} - \frac{7}{x+3} \right) = \frac{30}{(x-3)(x+3)} (x-3)(x+3)$$

$$(x+3)(x+2) - 7(x-3) = 30$$

$$x^2 + 5x + 6 - 7x + 21 = 30$$

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

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

~~$x = 3$~~ , $x = -1$

check:

$x = 3$ undefined

$x = -1$ okay