

Multiple Choice Answers

Name: _____

Section: _____

Last 4 digits of student ID #: _____

This exam has ten multiple choice questions (five points each) and five free response questions (ten 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.

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		50
11		10
12		10
13		10
14		10
15		10
Total		100

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

1. The limit $\lim_{x \rightarrow \infty} \frac{5x^4 + 8x^2}{3x^4 - 16x^2 + \sqrt{x}}$ is

A. $-\frac{1}{2}$

B. 0

C. 1

D. $\frac{5}{3}$

E. The limit does not exist.

2. What is $h'(4)$ if $h(x) = (5x - 1)f(x)$, $f(4) = 2$, and $f'(4) = 1$.

A. 0

B. -1

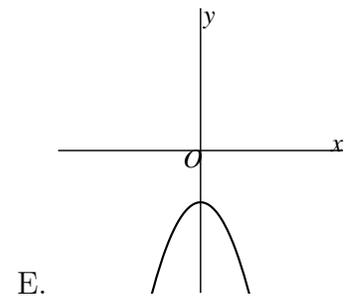
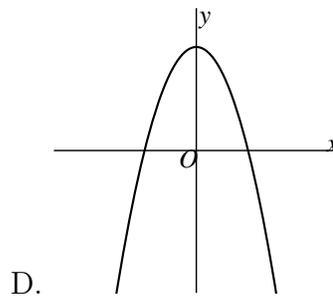
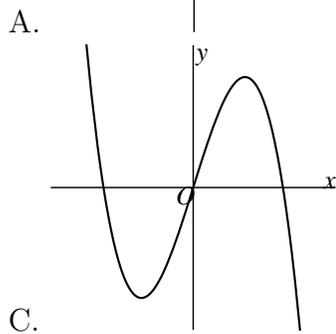
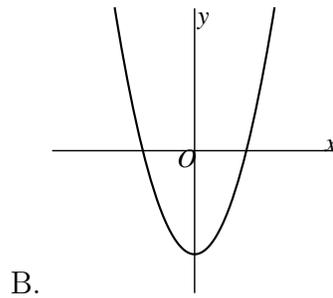
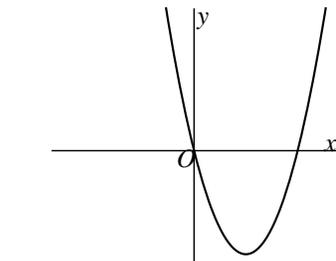
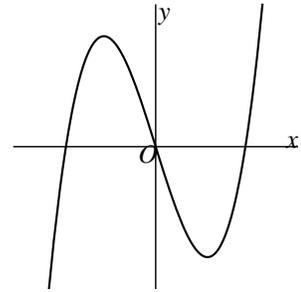
C. 9

D. 19

E. 29

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

3. The graph of a function $f(x)$ is shown on the right. Which of the graphs A. - E. could be the graph of $f'(x)$, the derivative of $f(x)$?



4. What does the limit $\lim_{x \rightarrow 1} \frac{\ln(x+1) - \ln(2)}{x-1}$ represent?
- A. 0
- B. $\frac{d}{dx} \ln(x+1)$
- C. $f'(1)$, if $f(x) = \ln(x+1)$
- D. 1
- E. The limit does not exist.

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

5. What is $g'(0)$ if $g(x) = \frac{x - f(x)}{3 - x^2}$, $f(0) = 1$, and $f'(0) = -1$?
- A. 0
 - B. $\frac{2}{3}$
 - C. $\frac{5}{9}$
 - D. $\frac{7}{9}$
 - E. 2
6. What is $h'(1)$ if $h(x) = \arcsin(f(x))$, $f(1) = 0$, and $f'(1) = 1$? (Note, $\arcsin(x)$ is also denoted by $\sin^{-1}(x)$.)
- A. 1
 - B. π
 - C. 2
 - D. 2π
 - E. 4

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

7. What is $\frac{d}{dx} \ln\left(\frac{2x+1}{4x-7}\right)$?

A. $\frac{2}{2x+1} + \frac{4}{4x-7}$

B. $\frac{2}{2x+1} - \frac{4}{4x-7}$

C. $\frac{4x-7}{2x+1}$

D. $\frac{(4x-7)^2}{2x+1}$

E. None of the above.

8. If $f(x) = (2x+1)^4$, then the fourth derivative of f at $x = 0$, $f^{(4)}(0)$, is

A. 0

B. 24

C. 48

D. 240

E. 384

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

9. The slope of the tangent line to the curve $y = e^{-2x}$ at the point $(0, 1)$ is

A. -1

B. -2

C. 1

D. 2

E. 4

10. The derivative of $f(x) = \sin(\cos(x^2))$ is

A. $\cos(\sin(x^2))$

B. $2 \cos(\cos(x^2)) \cdot \sin(x^2)$

C. $-2x \cdot \cos(\sin(x^2))$

D. $-2x \cdot \cos(\cos(x^2)) \cdot \sin(x^2)$

E. None of the above.

Free Response Questions: Show your work!

11. Consider the function f defined by

$$f(x) = \begin{cases} x^2 - x & \text{if } x \leq 1 \\ \ln x & \text{if } x > 1. \end{cases}$$

Determine whether or not f is differentiable at $x = 1$ and explain your reasoning. If f is differentiable at $x = 1$, find $f'(1)$.

Free Response Questions: Show your work!

12. Show that there is a number x such that $e^x = x^4$. Explain your reasoning carefully.

Free Response Questions: Show your work!

- 13.** A particle is moving along a straight line. After t seconds of movement its position is $s(t) = te^{-\frac{t}{2}}$ meters.
- (a) When is the particle at rest?
 - (b) When is the particle moving to the left?
 - (c) What is the total distance traveled by the particle over the time interval $[0, 4]$?

Free Response Questions: Show your work!

14. Consider the curve described by the equation

$$x^4 e^y + 2\sqrt{y+1} = 3.$$

Find the equation of the tangent line to this curve at the point $(1, 0)$. Give the equation in the form $y = mx + b$.

Free Response Questions: Show your work!

15. A runner is jogging due east at 8 kilometers per hour. A lighthouse is located 3 kilometers due north of her starting point. How fast is the distance between the runner and the lighthouse increasing when the runner is 5 kilometers away from the lighthouse? Include units in your answer and draw a picture of the situation, which includes the relevant quantities.