

Do not remove this answer page — you will turn in the entire exam. No books or notes may be used. You may use an ACT-approved calculator during the exam, but NO calculator with a Computer Algebra System (CAS), networking, or camera is permitted. Absolutely no cell phone use during the exam is allowed.

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a b c d e

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GOOD LUCK!

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For grading use:

Multiple Choice	Short Answer
(number right) (5 points each)	(out of 10 points)

Total	
	(total 100 points)

Name:

Last 4 digits of Student ID:

Spring 2017 Exam 1 Short Answer Questions

Write answers on this page. You must show appropriate legible steps to be sure you will get full credit.

1. Let $f(x) = 5x^2 - 7x + 8$. Find a value of x such that the slope of the tangent line to the graph of $f(x)$ equals 23 at that x value.

2. Let $f(x) = 4x^2 + 10$. Find the average rate of change of $f(x)$ with respect to x as x changes from 3 to $3+h$. **Simplify** your answer, and circle your final answer.

Multiple Choice Questions

*Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.*

3. Solve the equation $4x^2 + 106xy + 2y = 9$ for y in terms of x

Possibilities:

(a) $y = \frac{-106 \pm \sqrt{11204}}{8}$

(b) $y = \frac{9 - 4x^2 - 106x}{2}$

(c) $y = \frac{9 - 4x^2}{106x + 2}$

(d) $y = \frac{4x^2 - 9}{106x + 2}$

(e) $y = \frac{106x + 2}{4x^2 - 9}$

4. Evaluate $f(3)$ when $f(x)$ is given by the piecewise definition

$$f(x) = \begin{cases} x^2 - 7 & \text{if } x \leq 2 \\ 4x - 1 & \text{if } 2 < x < 3 \\ x^2 - 8x & \text{if } 3 \leq x \end{cases}$$

Possibilities:

(a) 2

(b) -15

(c) 7

(d) 11

(e) DNE

-
5. If $h(t)$ represents the height of an object in feet above ground level at time t seconds and $h(t)$ is given by $h(t) = -16t^2 + 13t + 110$, find the height of the object at the time when the speed of the object is zero.

Possibilities:

- (a) $(13/16)$ feet
- (b) 110 feet
- (c) $(7273/64)$ feet
- (d) $(7209/64)$ feet
- (e) $(13/32)$ feet

-
6. If $f(x) = \sqrt{x+2}$ then choose the simplified form of $\frac{f(x+h)-f(x)}{h}$:

Possibilities:

- (a) $\frac{1}{\sqrt{x+h+2} + \sqrt{x+2}}$
- (b) $\frac{1}{2}\sqrt{x+h+2} - \frac{1}{2}\sqrt{x+2}$
- (c) $\frac{h\sqrt{x+2} + \frac{1}{2}}{\sqrt{x+2}}$
- (d) $\frac{\frac{1}{2}}{\sqrt{x+h+2}}$
- (e) 1

7. For the function $f(x) = 5x^2 + 3x + 2$, find the equation of the tangent line to the graph of f at $x = 5$.

Possibilities:

(a) $y = 142$

(b) $y = 53x + 142$

(c) $y = 53x - 123$

(d) $y = 142x - 657$

(e) $y = x^3 + 17$

8. Let $f(x) = 5x^2 + 3x + 2$. Find a value c between $x = 3$ and $x = 7$, so that the average rate of change of $f(x)$ from $x = 3$ to $x = 7$ is equal to the instantaneous rate of change of $f(x)$ at $x = c$.

Possibilities:

(a) 1

(b) 2

(c) 3

(d) 4

(e) 5

9. If $\lim_{x \rightarrow 11} f(x) = 7$ and $\lim_{x \rightarrow 11} g(x) = 5$, then what is the value of $\lim_{x \rightarrow 11} \frac{(x + 17)(f(x) + 1)}{g(x)}$?

Possibilities:

- (a) 0
- (b) the limit is infinity or does not exist
- (c) $\frac{7}{5}$
- (d) $\frac{(11 + 17)(7 + 1)}{5}$
- (e) $\frac{(11)(7)}{5}$

10. Compute $\lim_{t \rightarrow 8} \frac{t^2 - t - 56}{t^2 - 3t - 40}$

Possibilities:

- (a) $\frac{14}{13}$
- (b) $\frac{15}{13}$
- (c) $\frac{16}{13}$
- (d) $\frac{17}{13}$
- (e) The limit does not exist.

11. Find the limit

$$\lim_{t \rightarrow 0^+} \frac{50\sqrt{t}}{t}$$

Possibilities:

- (a) 25
- (b) $\frac{25}{\sqrt{t}}$
- (c) This limit either tends to infinity or this limit fails to exist
- (d) 0
- (e) 50

12. Find the limit

$$\lim_{x \rightarrow \infty} \frac{7x + 11x^3 + 6}{13 + 23x^3 + x^2}$$

Possibilities:

- (a) $\frac{11}{23}$
- (b) The limit does not exist or approaches infinity
- (c) $\frac{7}{13}$
- (d) $\frac{24}{37}$
- (e) 6

13. For the function

$$f(x) = \begin{cases} |2 + 3x| & \text{if } x < -1 \\ \sqrt{x^2 + 3} & \text{if } -1 \leq x < 2 \\ 8x^2 + 9x + 4 & \text{if } 2 \leq x \end{cases}$$

find $\lim_{x \rightarrow 6^+} f(x)$

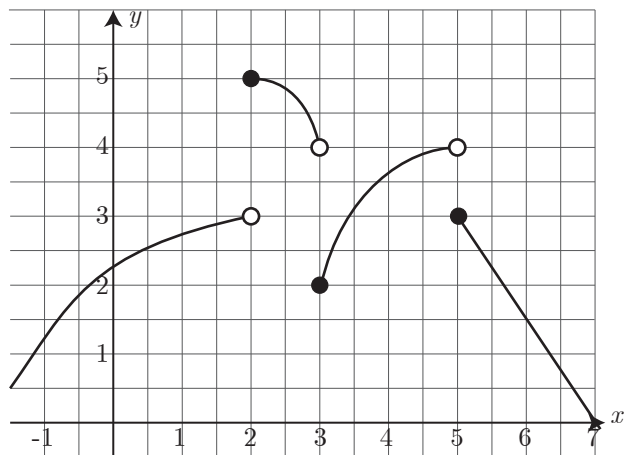
Possibilities:

- (a) 54
- (b) $\sqrt{39}$
- (c) $\sqrt{7}$
- (d) 346
- (e) 20

14. The graph of $y = f(x)$ is shown below. Compute $\lim_{x \rightarrow 2^-} f(x)$.

Possibilities:

- (a) 5
- (b) The limit does not exist or approaches infinity
- (c) 4
- (d) 2
- (e) 3



15. Consider the function $f(x) = \begin{cases} Ax^2 & \text{if } x < 3 \\ 11 - Ax & \text{if } x \geq 3 \end{cases}$

Find a value of A so that the function is continuous at $x = 3$.

Possibilities:

- (a) $\frac{2}{3}$
- (b) $\frac{3}{4}$
- (c) $\frac{5}{6}$
- (d) $\frac{11}{12}$
- (e) 1

16. Find all values of x where the derivative is not defined for $f(x) = |x^2 - 12x + 32|$.

Possibilities:

- (a) $x = 4$ and $x = 8$
- (b) $x = -12$ and $x = 32$
- (c) $x = 0$ and $x = 32$
- (d) $x = 32$ only
- (e) $x = -12$ only

17. Suppose that for a function $f(x)$, we know that

$$\frac{f(x+h) - f(x)}{h} = \frac{-2xh - h^2 - 7h}{h(x+7)^2(x+h+7)^2}.$$

Find the slope of the tangent line at $x = 6$.

Possibilities:

- (a) The slope does not exist.
- (b) $\frac{-12}{13^2}$
- (c) $\frac{-19}{13^4}$
- (d) $\frac{-12}{13^4}$
- (e) 0

18. Let $f(x) = x^2 - 42x + 8$. What is the value of x for which the tangent line to the graph of $y = f(x)$ is parallel to the x -axis?

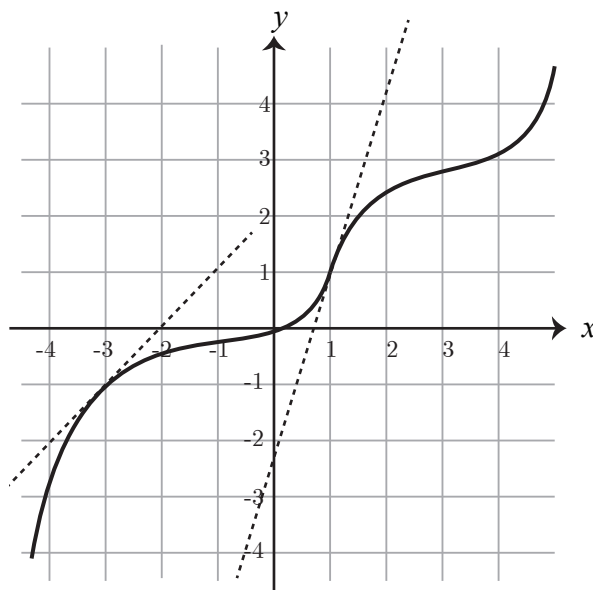
Possibilities:

- (a) -42
- (b) 8
- (c) -34
- (d) 21
- (e) 22

19. Determine the value of $f'(-3)$ from the graph of $f(x)$ given here:

Possibilities:

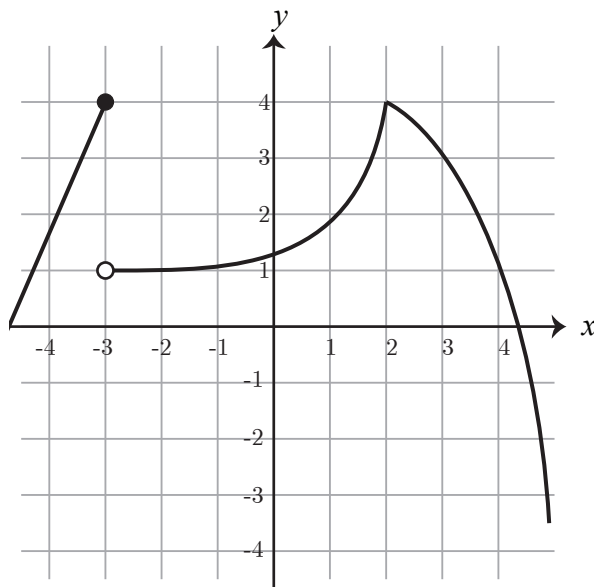
- (a) $f'(-3) = -3$
- (b) $f'(-3) = 1$
- (c) $f'(-3) = 0$
- (d) $f'(-3) = -1$
- (e) $f'(-3) = 3$



20. Determine the x values where the derivative is not defined (that is, the points where the function is not differentiable) on the function graphed here:

Possibilities:

- (a) $x = -1$ and $x = 3$
- (b) $x = -2$ and $x = 1$
- (c) $x = -2$ and $x = 3$
- (d) $x = -3$ and $x = 2$
- (e) $x = -3$ and $x = 1$



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