

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	
	(out of 100 points)

Fall 2017 Exam 1 Short Answer Questions

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

1. Evaluate the limit: $\lim_{x \rightarrow 5} \frac{x^2 - 4x - 5}{x^2 - 6x + 5}$

Final answer: _____

2. Let $f(x) = x^2 + 3x + 10$. Find the **equation** of the tangent line to $f(x)$ at $x = 1$.

Equation of tangent line: _____

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. The expression

$$\frac{x^{24} (2x)^6}{x^8}$$

can be simplified to which of the following?

Possibilities:

- (a) $2x^{22}$
- (b) $64x^{14}$
- (c) $64x^{22}$
- (d) $2x^{14}$
- (e) $2x^{18}$

4. Find the domain of the function

$$f(x) = \sqrt{6 - x}.$$

Possibilities:

- (a) $[0, \infty]$
 - (b) $(-\infty, 6]$
 - (c) $[6, \infty)$
 - (d) $(-\infty, 6)$
 - (e) $(6, \infty)$
-

-
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 $h(t) = -16t^2 + 21t + 138$, find the time at which the speed of the object is zero.

Possibilities:

- (a) 138 seconds
- (b) $(53/32)$ seconds
- (c) $(21/16)$ seconds
- (d) $(69/16)$ seconds
- (e) $(21/32)$ seconds

-
6. If $f(x) = \sqrt{x+4}$ then choose the simplified form of $\frac{f(x+h)-f(x)}{h}$:

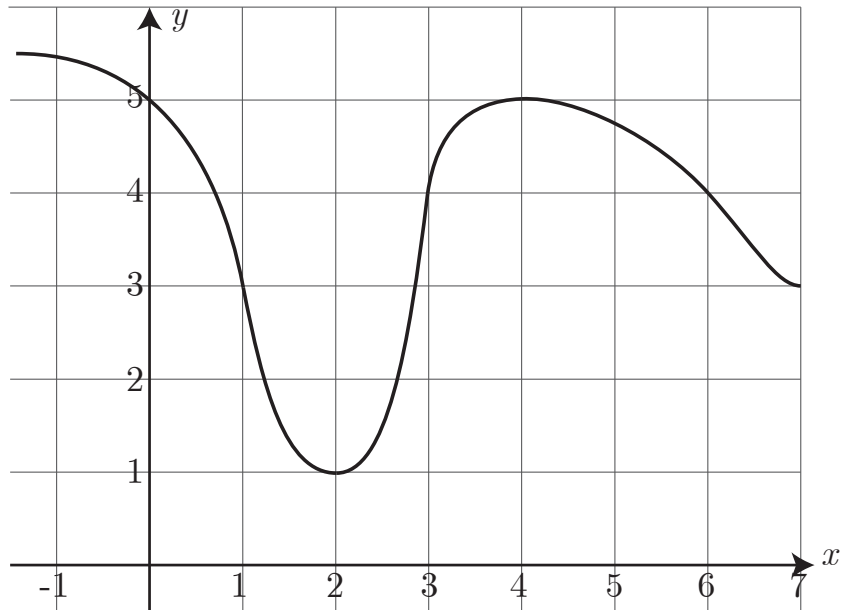
Possibilities:

- (a) $\frac{1}{\sqrt{x+h+4} + \sqrt{x+4}}$
- (b) $\frac{\frac{1}{2}}{\sqrt{x+h+4}}$
- (c) 1
- (d) $\frac{1}{2}\sqrt{x+h+4} - \frac{1}{2}\sqrt{x+4}$
- (e) $\frac{h\sqrt{x+4} + \frac{1}{2}}{\sqrt{x+4}}$

-
7. The graph of $y = f(x)$ is shown below. Compute the average rate of change of $f(x)$ from $x = 1$ to $x = 3$.

Possibilities:

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



-
8. Let $f(x) = x^3$. Find a value c between $x = 0$ and $x = 8$, so that the average rate of change of $f(x)$ from $x = 0$ to $x = 8$ is equal to the instantaneous rate of change of $f(x)$ at $x = c$. You may use the fact that $f'(x) = 3x^2$.

Possibilities:

- (a) 192
- (b) $\frac{8}{\sqrt{3}}$
- (c) 6
- (d) $\frac{8}{\sqrt{5}}$
- (e) $\frac{\sqrt{3}}{8}$

9. If $\lim_{x \rightarrow 3} f(x) = 11$ and $\lim_{x \rightarrow 3} g(x) = 17$, then what is the value of $\lim_{x \rightarrow 3} \frac{(x + 5)(f(x) + 1)}{g(x)}$?

Possibilities:

(a) $\frac{11}{17}$

(b) 0

(c) the limit is infinity or does not exist

(d) $\frac{(3 + 5)(11 + 1)}{17}$

(e) $\frac{(3)(11)}{17}$

10. Find the limit

$$\lim_{x \rightarrow 36} \frac{x^2 - 16}{x - 36}$$

Possibilities:

(a) 0

(b) $\frac{16}{36}$

(c) 40

(d) 1

(e) This limit either tends to infinity or this limit fails to exist

11. Find the limit

$$\lim_{t \rightarrow 1} \frac{36\sqrt{t}}{t}$$

Possibilities:

- (a) 18
- (b) $\frac{18}{\sqrt{t}}$
- (c) 36
- (d) 0
- (e) This limit either tends to infinity or this limit fails to exist

12. Find the limit

$$\lim_{n \rightarrow \infty} \frac{(4n + 3)^2}{13n^5 + 4n^2 + 11}$$

Possibilities:

- (a) 0
- (b) $\frac{4}{13}$
- (c) The limit does not exist or approaches infinity
- (d) $\frac{16}{13}$
- (e) $\frac{16}{11}$

13. For the function

$$f(x) = \begin{cases} |4 + 8x| & \text{if } x < -2 \\ \sqrt{x^2 + 6} & \text{if } -2 \leq x < 3 \\ 3x^2 + x + 5 & \text{if } 3 \leq x \end{cases}$$

find $\lim_{x \rightarrow 5^+} f(x)$

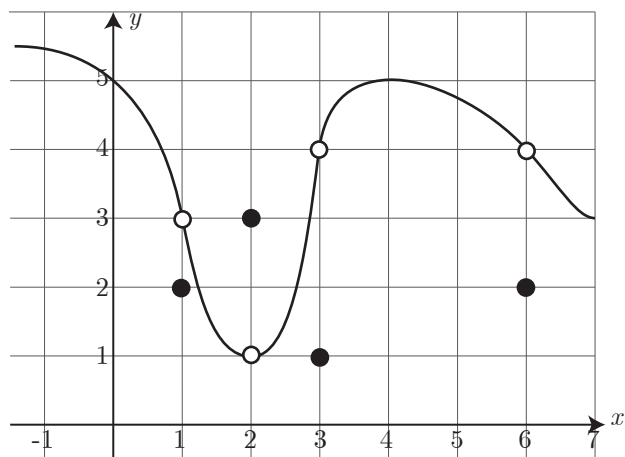
Possibilities:

- (a) $\sqrt{31}$
- (b) 85
- (c) $\sqrt{15}$
- (d) 35
- (e) 44

14. The graph of $y = f(x)$ is shown below. Compute $\lim_{x \rightarrow 1} f(x)$.

Possibilities:

- (a) The limit does not exist or approaches infinity
- (b) 0
- (c) 2
- (d) 1
- (e) 3



15. Consider the function $f(x) = \begin{cases} x^2 - 4 & \text{if } x < 8 \\ 2x + B & \text{if } x \geq 8 \end{cases}$

Find a value of B so that the function is continuous at $x = 8$.

Possibilities:

- (a) 41
- (b) 42
- (c) 43
- (d) 44
- (e) 45

16. Find all values of x where the derivative is not defined for $f(x) = |x^2 - 14x + 45|$.

Possibilities:

- (a) $x = 5$ and $x = 9$
- (b) $x = -14$ and $x = 45$
- (c) $x = -14$ only
- (d) $x = 45$ only
- (e) $x = 0$ and $x = 45$

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

$$\frac{f(x+h) - f(x)}{h} = \frac{-2xh - h^2 - 8h}{h(x+8)^2(x+h+8)^2}.$$

Find the slope of the tangent line at $x = 7$.

Possibilities:

- (a) $\frac{-14}{15^4}$
- (b) $\frac{-14}{15^2}$
- (c) $\frac{-22}{15^4}$
- (d) 0
- (e) The slope does not exist.

18. Consider the function $f(x) = x^2 + 4x + 7$. Its tangent line at $x = 3$ goes through the point $(6, y_1)$ where y_1 is:

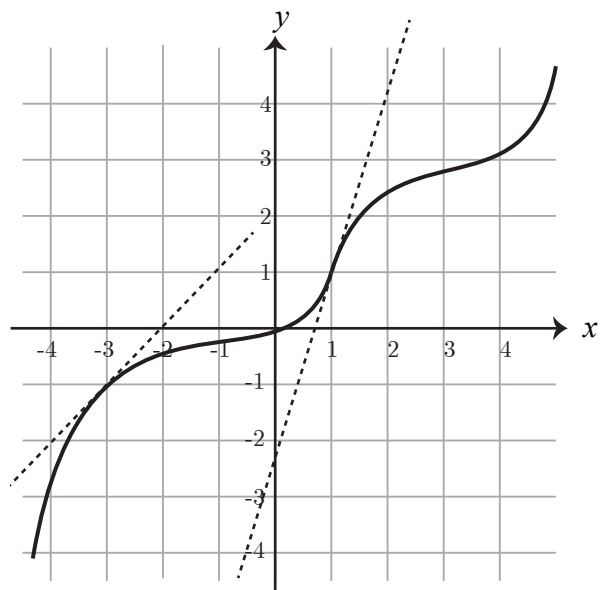
Possibilities:

- (a) 10
- (b) 58
- (c) 16
- (d) -2
- (e) 28

19. Determine the value of $f'(1)$ from the graph of $f(x)$ given here:

Possibilities:

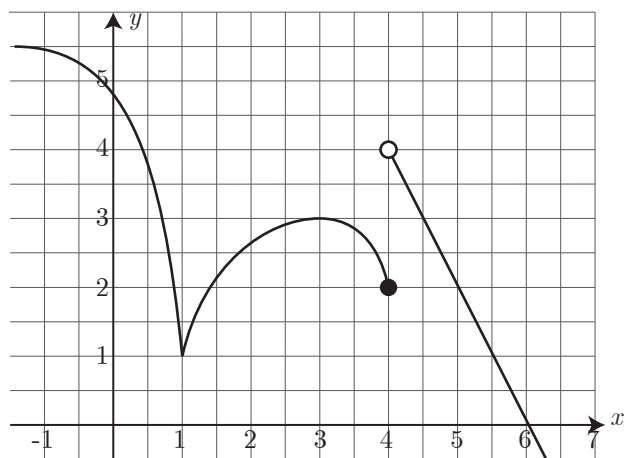
- (a) $f'(1) = 0$
- (b) $f'(1) = -3$
- (c) $f'(1) = 1$
- (d) $f'(1) = -1$
- (e) $f'(1) = 3$



20. The graph of $y = f(x)$ is shown below. The function is **continuous**, except at $x =$

Possibilities:

- (a) $x=1$, $x=3$, and $x=4$
- (b) $x=1$ and $x=4$
- (c) $x=1$ only
- (d) $x=4$ only
- (e) $x=1$, $x=3$, $x=4$, and $x=6$



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