**MA123 — Elem. Calculus**   Fall 2018
Exam 1                        2018-09-20

**Name:** _____ **Sec.:** _____

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The exam consists of two short answer questions and eighteen multiple choice questions. Answer the short answer questions on the back of this page, and record your answers to the multiple choice questions on this page. For each multiple choice question, you will need to fill in the circle corresponding to the correct answer. It is your responsibility to make it CLEAR which response has been chosen. For example, if (a) is correct, you must write

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**GOOD LUCK!**

3.  (a) (b) (c) (d) (e)        12. (a) (b) (c) (d) (e)

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**For grading use:**

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

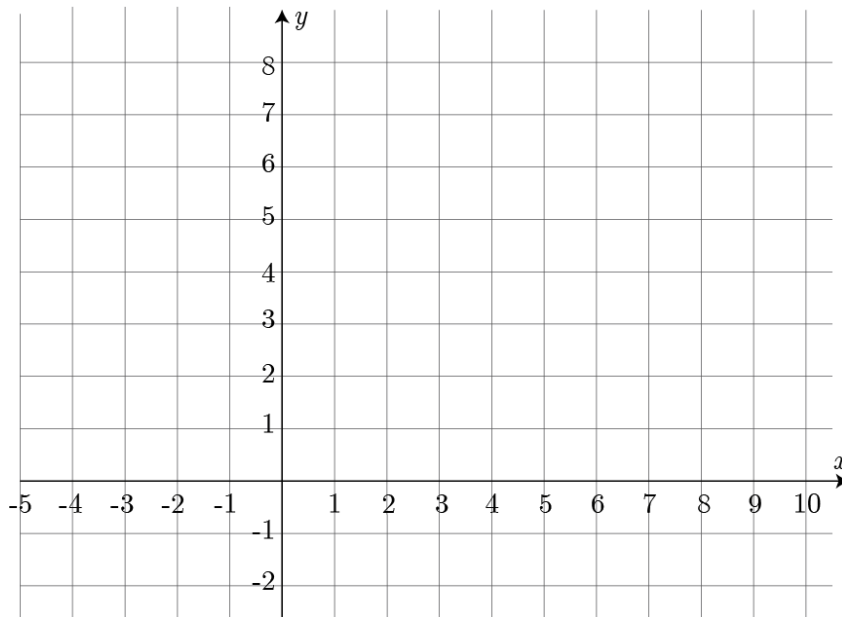| Total | |
|---|---|
| | (out of 100 points) |

**Fall 2018 Exam 1 Short Answer Questions**

*Write answers on this page. Your work must be clear and legible to be sure you will get full credit.*

1. Sketch the graph of a single function $y = f(x)$ which satisfies the following properties:

   $\lim\limits_{x \to 1^-} f(x) = 6$, $\lim\limits_{x \to 1^+} f(x) = 3$, $\lim\limits_{x \to 7} f(x) = 2$, $f(7) = 5$, and $f(x)$ is continuous for all $x$ except $x = 1$ and $x = 7$.



2. Let $f(x) = 5x^2 + 8$. Find the **equation** of the tangent line to $f(x)$ at $x = 3$. You do not need to simplify your answer.

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. Simplify the expression
$$\frac{60x^{18} - 90x^{15} - 50x^7}{-10x^5}.$$

**Possibilities:**

(a) $-6x^{13} + 9x^{10} + 5x^2$

(b) $60x^{18} - 90x^{15} - 50x^7 + 10x^5$

(c) $-6x^{13} + 90x^{15} + 50x^7$

(d) $-60x^{18} + 90x^{15} + 5x^2$

(e) $-6x^{13} - 9x^{10} - 5x^2$

4. Find the domain of the function
$$f(x) = \sqrt{7 - x}.$$

**Possibilities:**

(a) $[7, \infty)$

(b) $(-\infty, 7]$

(c) $(7, \infty)$

(d) $[0, \infty]$

(e) $(-\infty, 7)$

5. Let $f(x) = x^2 - 62x + 9$. 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) 32

(b) 9

(c) $-53$

(d) $-62$

(e) 31

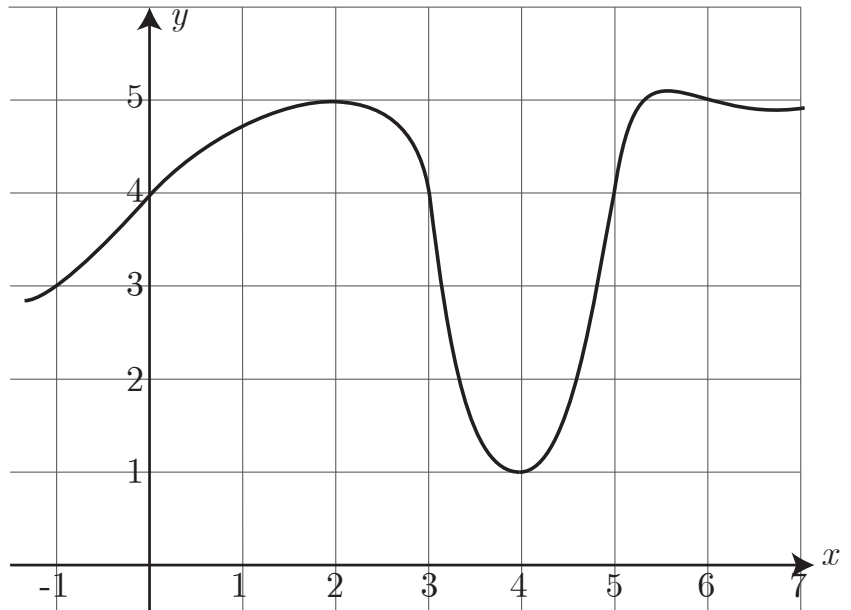6. If $f(x) = \sqrt{x+4}$ then choose the simplified form of $\frac{f(x+h)-f(x)}{h}$:

**Possibilities:**

(a) 1

(b) $\dfrac{h\sqrt{x+4}+\frac{1}{2}}{\sqrt{x+4}}$

(c) $\dfrac{1}{\sqrt{x+h+4}+\sqrt{x+4}}$

(d) $\dfrac{\frac{1}{2}}{\sqrt{x+h+4}}$

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

7. The graph of $y = f(x)$ is shown below. Compute the average rate of change of $f(x)$ from $x = -1$ to $x = 2$.

**Possibilities:**

(a) $\dfrac{1}{4}$

(b) $-\dfrac{2}{5}$

(c) $\dfrac{1}{6}$

(d) $\dfrac{2}{3}$

(e) $\dfrac{2}{7}$



8. Let $f(x) = x^3$. Find a value $c$ between $x = 0$ and $x = 10$, so that the average rate of change of $f(x)$ from $x = 0$ to $x = 10$ 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) $\dfrac{10}{\sqrt{3}}$

(b) 5

(c) 300

(d) $\dfrac{10}{\sqrt{5}}$

(e) $\dfrac{\sqrt{3}}{10}$

9. If $\lim\limits_{x \to 7} f(x) = 13$ and $\lim\limits_{x \to 7} g(x) = 11$, then what is the value of $\lim\limits_{x \to 7} \dfrac{17f(x) + 2}{x + g(x)}$?

**Possibilities:**

(a) $\dfrac{13}{11}$

(b) 0

(c) $\dfrac{(17)(13)(7) + 2}{7 + (11)(7)}$

(d) $\dfrac{(17)13 + 2}{7 + 11}$

(e) the limit is infinity or does not exist

10. Compute $\lim\limits_{t \to 1} \dfrac{t^2 - 1}{t^2 + 5t - 6}$

**Possibilities:**

(a) 0

(b) The limit does not exist.

(c) 1

(d) $\frac{9}{7}$

(e) $\frac{2}{7}$

11. Find the one-sided limit

$$\lim_{t \to 0^-} \frac{|36t|}{t}$$

**Possibilities:**

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

(b) 36

(c) $\frac{18}{\sqrt{t}}$

(d) 0

(e) -36

12. Find the limit

$$\lim_{x \to \infty} \frac{11x + 17x^3 + 6}{19 + x^2 + 13x^3}$$

**Possibilities:**

(a) $\frac{17}{13}$

(b) $\frac{34}{33}$

(c) 6

(d) The limit does not exist or approaches infinity

(e) $\frac{11}{19}$

13. Given the function $f(x) = \begin{cases} x & \text{if } x \leq 0 \\ 15x + 6 & \text{if } x > 0 \end{cases}$

evaluate the limit as $x$ tends to zero from the right,

$$\lim_{x \to 0^+} f(x)$$

**Possibilities:**

(a) 15

(b) This limit does not exist

(c) 21

(d) 6

(e) 0

14. If $f(x) = x^2 + 4x + 7$ then choose the simplified form of $\frac{f(x+h)-f(x)}{h}$:

**Possibilities:**

(a) $2x + 2h + 4$

(b) $2x + 4 + h$

(c) $-2x - 4 - h$

(d) 6

(e) $\dfrac{h^2 + (2x + 4)h + 2x^2 + 8x + 14}{2x + h}$

15. Consider the function $f(x) = \begin{cases} Ax^3 & \text{if } x < 2 \\ 6 - Ax & \text{if } x \geq 2 \end{cases}$

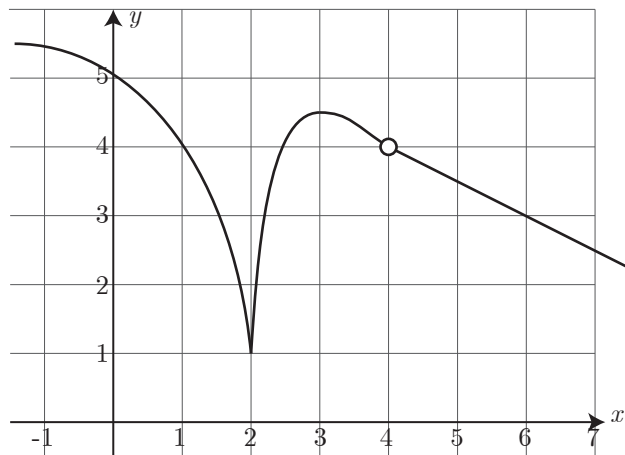Find a value of $A$ so that the function is continuous at $x = 2$.

**Possibilities:**

(a) $\dfrac{1}{5}$

(b) $\dfrac{2}{5}$

(c) $\dfrac{3}{5}$

(d) $\dfrac{4}{5}$

(e) 1

16. The graph of $y = f(x)$ is shown below. $f'(6)$ is approximately :

**Possibilities:**

(a) $-\frac{1}{2}$

(b) $\frac{1}{2}$

(c) $-2$

(d) 3

(e) 2

17. For the function $f(x) = (x + 8)^2$, find the equation of the tangent line to the graph of $f$ at $x = 3$.

**Possibilities:**

(a) $y = 22x + 121$

(b) $y = 22x + 55$

(c) $y = 6x + 103$

(d) $y = 6x + 121$

(e) $y = x + 8$

18. Consider the function $f(x) = x^2 + 4x + 7$. Its tangent line at $x = 3$ goes through the point $(9, y_1)$ where $y_1$ is:
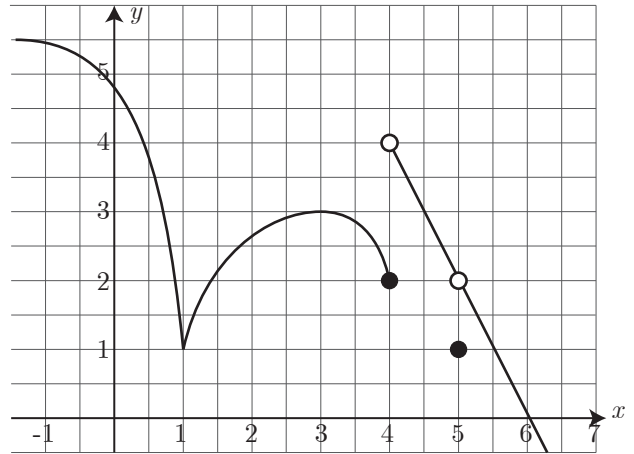
**Possibilities:**

(a) 28

(b) $-2$

(c) 10

(d) 88

(e) 22

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

**Possibilities:**

(a) x=1, x=4, and x=5

(b) x=1, x=3, x=4, and x=5

(c) x=4 and x=5

(d) x=1 and x=3

(e) x=4 only



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

**Possibilities:**

(a) x=1, x=4, and x=5

(b) x=4 and x=5

(c) x=1, x=3, x=4, and x=5

(d) x=1 and x=3

(e) x=4 only



11

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| Total | |
| --- | --- |
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