MA123 — Elem. Calculus Spring 2018
Exam 2 2018-3-8

Name: _____ **Sec.:** _____

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(a) (b) (c) (d) (e)

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GOOD LUCK!

3.	a	b	c	d	e	**12.**	a	b	c	d	e
4.	a	b	c	d	e	**13.**	a	b	c	d	e
5.	a	b	c	d	e	**14.**	a	b	c	d	e
6.	a	b	c	d	e	**15.**	a	b	c	d	e
7.	a	b	c	d	e	**16.**	a	b	c	d	e
8.	a	b	c	d	e	**17.**	a	b	c	d	e
9.	a	b	c	d	e	**18.**	a	b	c	d	e
10.	a	b	c	d	e	**19.**	a	b	c	d	e
11.	a	b	c	d	e	**20.**	a	b	c	d	e

For grading use:

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

Total	
	(out of 100 points)

Spring 2018 Exam 2 Short Answer Questions

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

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1. Let $H(x) = \left(x^2 + f(x)\right)^3$. Given that $f(1) = -4$ and $f'(1) = 6$, find $H'(1)$. Clearly circle your final answer.

2. The length of a rectangle is increasing at a rate of 3 cm/min and its width is increasing at a rate of 10 cm/min. When the length is 15 cm and the width is 6cm, how fast is the area of the rectangle increasing? (**Show appropriate calculus steps clearly** and circle your final answer.)

Name: _____

Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer on the cover page on this exam.

3. For the function $f(x) = \ln(7x^3 + 2x^2 + 3x + 17)$, find the equation of the tangent line to the graph of f at $x = 0$.

Possibilities:

(a) $y = \frac{3}{17}x + \ln(17)$

(b) $y = \dfrac{21x^3 + 4x^2 + 3x}{7x^3 + 2x^2 + 3x + 17} + \ln(17)$

(c) $y = \ln(17)\, x + 3$

(d) $y = 17$

(e) $y = \frac{17}{3}x + \ln(17)$

4. Find the derivative, $f'(x)$, if $f(x) = \sqrt[7]{6x^3 + x^2 + 2x + 7}$.

Possibilities:

(a) $(1/7)(6x^3 + x^2 + 2x + 7)(18x^2 + 2x + 2)$

(b) $\sqrt[7]{18x^2 + 2x + 2}$

(c) $(1/7)(6x^3 + x^2 + 2x + 7)^{-1/7}$

(d) $(1/7)(6x^3 + x^2 + 2x + 7)^{-6/7}(18x^2 + 2x + 2)$

(e) $\dfrac{\sqrt[7]{18x^2 + 2x + 2}}{\sqrt[7]{6x^3 + x^2 + 2x + 7}}$

5. Find the derivative, $f'(x)$, if $f(x) = e^{8x+3} + 20x + 60$.

Possibilities:

(a) $(8x + 3)e^{8x+2} + 20$

(b) $\dfrac{8}{8x + 3} + 20$

(c) $e^8 + 20$

(d) $\ln(8x + 3) + 80$

(e) $8e^{8x+3} + 20$

6. Suppose $F(x) = g(x) \cdot h(x+2)$. If $g(0) = 9$, $g'(0) = 4$, $h(0) = 3$, $h'(0) = 8$, $h(2) = 5$, and $h'(2) = 6$, find $F'(0)$.

Possibilities:

(a) 60

(b) 84

(c) 74

(d) 35

(e) 128

---

7. Suppose $g(5) = 4$ and $g'(5) = 6$. Find $F'(5)$ if

$$F(x) = \frac{x^3}{g(x)}$$

Possibilities:

(a) $-\frac{225}{8}$

(b) $\frac{3}{2}$

(c) $\frac{225}{8}$

(d) $-\frac{225}{2}$

(e) -18

---

8. Suppose $H(x) = f(x^2 - 15)$. If $f(2) = 9$, $f'(2) = 4$, $f(-11) = 8$, and $f'(-11) = 3$, then find $H'(2)$.

Possibilities:

(a) 3

(b) 36

(c) 16

(d) -44

(e) 12

---

9. Suppose $F(x) = e^{g(x)}$. If $g(9) = 4$ and $g'(9) = 3$, find $F'(9)$.

Possibilities:

(a) $12e^3$

(b) $3e^3$

(c) $4e^3$

(d) $3e^4$

(e) e^4

---

10. For the function $f(x) = \begin{cases} x^2 - 4 & x < 10 \\ x^3 - 7 & 10 \leq x < 20 \\ \sqrt{x+9} & 20 \leq x \end{cases}$, find the slope of the tangent line to the graph of f at $x = 18$.

Possibilities:

(a) 972

(b) 320

(c) $\frac{1}{54}\sqrt{27}$

(d) 5825

(e) 36

---

11. Find the derivative, $f'(x)$, if $f(x) = \ln(\ln(7 + 2x))$.

Possibilities:

(a) $\dfrac{1}{\ln(\ln(7+2x))} \cdot \dfrac{1}{\ln(7+2x)} \cdot \dfrac{2}{7+2x}$

(b) $e^{\dfrac{2}{7+2x}}$

(c) $\dfrac{1}{\ln(7+2x)} \cdot \dfrac{2}{7+2x}$

(d) $\dfrac{1}{\dfrac{2}{7+2x}}$

(e) $\left(\dfrac{2}{7+2x}\right) e^{\ln(7+2x)}$

---

12. If $f(x) = 8x^7 + 3x^5 + 2x$ then find the third derivative $f'''(x)$:

Possibilities:

(a) $2744x^7 + 375x^5$

(b) $1680x^4 + 180x^2 + 13x$

(c) $336x^5 + 60x^3$

(d) $\dfrac{56x^6 + 15x^4 + 2}{x^2}$

(e) $1680x^4 + 180x^2$

---

13. If $f(x) = (17x + 31)^{22}$ then $f''(x) =$

Possibilities:

(a) $22^2\,(17)^{22}\,(17x + 31)$

(b) $22(21)17^{20}$

(c) $22\,(17x + 31)^{21}$

(d) $22(21)\,(17x + 31)^{20}\,(17)^2$

(e) 0

---

14. Find the derivative, $f'(x)$, of $f(x) = \frac{9}{x^{40}}$

Possibilities:

(a) $-360x^{-41}$

(b) $360x^{39}$

(c) $-40x^{-41}$

(d) $-40x^{-39}$

(e) $9/(40\,x^{39})$

---

15. If an amount of x dollars is invested at 5% interest compounded continuously, and at the end of 2 years the value of the investment is \$6000, find x.

Possibilities:

(a) \$4123.61

(b) \$5251.87

(c) \$5316.72

(d) \$5429.02

(e) \$6631.02

16. A bacteria culture starts with 2000 bacteria and doubles after 11 hours. If we express the number of bacteria after t hours as $y(t) = a \cdot e^{kt}$, find the value of k.

Possibilities:

(a) $11/\ln(2)$

(b) $2000/\ln(2)$

(c) $\ln(2)/\ln(11)$

(d) 2000

(e) $\ln(2)/11$

17. A sphere is growing so its volume is increasing at a rate of 81 cubic feet per minute. At what rate is the radius changing when its radius is 3 feet?

Possibilities:

(a) $\frac{81}{36\pi}$ feet per minute

(b) $\frac{108\pi}{3}$ feet per minute

(c) $\frac{36\pi}{81}$ feet per minute

(d) $\frac{81}{12\pi}$ feet per minute

(e) 2916π feet per minute

18. A street light is at the top of a 17 foot tall pole. A child who is 4 feet tall runs away from the pole with a speed of 7ft/sec along a straight path. How fast is the tip of his shadow moving when he is 49 feet from the base of the pole?

Possibilities:

(a) $\frac{119}{49}$ feet per second

(b) $\frac{119}{13}$ feet per second

(c) $\frac{119}{4}$ feet per second

(d) $\frac{28}{17}$ feet per second

(e) $\frac{343}{17}$ feet per second

19. The graph of $y = f(x)$ is shown below. What is the maximum value of $f(x)$ on the interval $[-3, 4]$?

Possibilities:

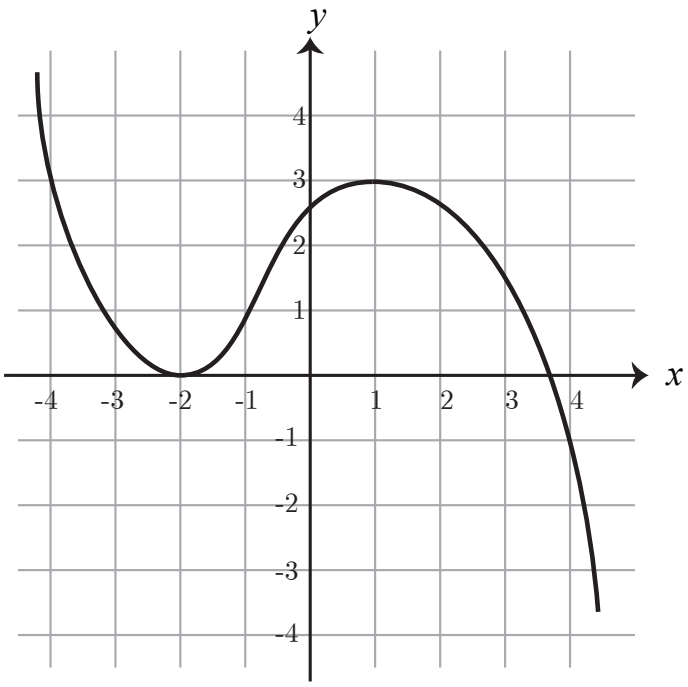
(a) 4

(b) 2

(c) 3

(d) -1

(e) 0



20. Find the minimum value of $g(t) = t^3 - 48t + 50$ on the interval $[-2, 5]$.

Possibilities:

(a) 138

(b) 178

(c) -65

(d) -78

(e) -36

Some Formulas

1. Areas:

(a) Triangle $A = \dfrac{bh}{2}$

(b) Circle $A = \pi r^2$

(c) Rectangle $A = lw$

(d) Trapezoid $A = \dfrac{h_1 + h_2}{2}\, b$

2. Volumes:

(a) Rectangular Solid $V = lwh$

(b) Sphere $V = \dfrac{4}{3}\pi r^3$

(c) Cylinder $V = \pi r^2 h$

(d) Cone $V = \dfrac{1}{3}\pi r^2 h$

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