MA123 — Elem. Calculus	Fall 2016	**Name:** ____________________ **Sec.:** ________
Exam 2	2016-10-20	

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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)

Name: **Last 4 digits of Student ID:**

Fall 2016 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.

4 pts 1. Find the derivative of $f\left(x\right)=\left(3x+1\right)e^{10x+2}$. **Do <u>NOT</u>** simplify your answer.

6 pts 2. A circle is growing so that its area is increasing at a rate of 100 square feet per minute. At what rate is the radius of the circle changing when its radius is 8 feet? (Show 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.

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3. For the function $f(x) = \ln(5x^2 + 6x + 2)$, find the equation of the tangent line to the graph of f at $x = 0$.

   Possibilities:

   (a) $y = \dfrac{2\,(5x+3)\,x}{5x^2 + 6x + 2} + \ln(2)$

   (b) $y = 2$

   (c) $y = 3x + \ln(2)$

   (d) $y = \ln(2)\,x + 6$

   (e) $y = \frac{1}{3}x + \ln(2)$

---

4. Find the derivative, $f'(x)$, if $f(x) = \sqrt[7]{2x^3 + 7x^2 + 8x + 1}$.

   Possibilities:

   (a) $(1/7)(2x^3 + 7x^2 + 8x + 1)^{-6/7}(6x^2 + 14x + 8)$

   (b) $\dfrac{\sqrt[7]{6x^2 + 14x + 8}}{\sqrt[7]{2x^3 + 7x^2 + 8x + 1}}$

   (c) $(1/7)(2x^3 + 7x^2 + 8x + 1)^{-1/7}$

   (d) $\sqrt[7]{6x^2 + 14x + 8}$

   (e) $(1/7)(2x^3 + 7x^2 + 8x + 1)(6x^2 + 14x + 8)$

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5. Find the derivative, $f'(x)$, if $f(x) = e^{2x+9} + 90x + 70$.

   Possibilities:

   (a) $\dfrac{2}{2x+9} + 90$

   (b) $2e^{2x+9} + 90$

   (c) $e^2 + 90$

   (d) $\ln(2x + 9) + 160$

   (e) $(2x + 9)e^{2x+8} + 90$

---

6. Suppose $F(x) = (x^3 + 3)g(x)$. If $g(1) = 4$ and $g'(1) = 8$, find $F'(1)$.

Possibilities:

(a) 44

(b) 15

(c) 16

(d) 40

(e) 24

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

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

Possibilities:

(a) $\frac{48}{49}$

(b) $-\frac{48}{49}$

(c) $-\frac{48}{7}$

(d) $\frac{6}{7}$

(e) -3

8. Suppose $H(x) = f(x^2 + g(x))$. If $g(2) = 7$, $g'(2) = 8$, $f'(12) = 10$, and $f'(11) = 17$, then find $H'(2)$.

Possibilities:

(a) $(17)(12) + (11)(10)$

(b) 17

(c) $10(11)(4 + 17)$

(d) 10

(e) $17(4 + 8)$

9. Suppose $F(x) = \ln(g(x))$. If $g(2) = 3$, $g'(2) = 11$, and $g''(2) = 7$, then find $F'(2)$.

Possibilities:

(a) $11/3$

(b) $3/11$

(c) $\ln(3)/11$

(d) $\ln(7)$

(e) $3/\ln(11)$

---

10. For the function $f(x) = \begin{cases} x^2 - 5 & x < 10 \\ \sqrt{x+9} & 10 \le x < 20 \\ x^3 - 6 & 20 \le x \end{cases}$, find the slope of the tangent line to the graph of f at $x = 18$.

Possibilities:

(a) 319

(b) 36

(c) 972

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

(e) $\sqrt{27}$

---

11. Find the derivative, $f'(x)$, if $f(x) = \ln(\ln(2+9x))$.

Possibilities:

(a) $\dfrac{1}{\ln(2+9x)} \cdot \dfrac{9}{2+9x}$

(b) $\left(\dfrac{9}{2+9x}\right) e^{\ln(2+9x)}$

(c) $e^{\dfrac{9}{2+9x}}$

(d) $\dfrac{1}{\dfrac{9}{2+9x}}$

(e) $\dfrac{1}{\ln(\ln(2+9x))} \cdot \dfrac{1}{\ln(2+9x)} \cdot \dfrac{9}{2+9x}$

12. If $f(x) = 5x^6 + 4x^4 + 2x^3$ then find the third derivative $f'''(x)$:

Possibilities:

(a) $30x^3 + 16x + 6$

(b) $30x^5 + 75x^4 + 116x^3 + 105x^2 + 52x + 11$

(c) $600x^3 + 96x + 12$

(d) $1080x^6 + 256x^4 + 54x^3$

(e) $150x^4 + 48x^2 + 12x$

---

13. If $f(x) = e^{11x+37}$ then $f''(x) =$

Possibilities:

(a) $27^2\,(11)^{27}\,(11x + 37)$

(b) $(11x + 37)(11x + 36)e^{11x+35}$

(c) $(11x + 37)(11x + 36)e^{11x+35} + 11e^{11x+36}$

(d) $11^2 e^{11x+37}$

(e) 0

---

14. Find the derivative, $f'(x)$, of $f(x) = \frac{1}{x^{30}}$

Possibilities:

(a) $-30x^{-29}$

(b) $-30x^{-31}$

(c) $1/(30\,x^{29})$

(d) $1/(30\,x^{31})$

(e) $30x^{29}$

15. How many years will it take an investment to triple in value if the interest rate is 9% compounded continuously?

Possibilities:

(a) 12.21 years

(b) .122 years

(c) 1.31 years

(d) 7.70 years

(e) 14.37 years

16. The number of bacteria in a culture doubles every 5 hours. If we begin with 1000 cells, about how many cells do we have after 8 hours?

Possibilities:

(a) 3200 cells

(b) 625,000 cells

(c) 3031 cells

(d) 1542 cells

(e) 5800 cells

17. A cylindrical water tank with its circular base parallel to the ground is being filled at the rate of 80 cubic feet per minute. The radius of the tank is 3 feet. How fast is the level of the water in the tank rising when the tank is half full?

Possibilities:

(a) 1507.96 feet per minute

(b) 1.41 feet per minute

(c) 2261.95 feet per minute

(d) 4523.89 feet per minute

(e) 2.83 feet per minute

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18. Boyle's Law states that when a sample gas is compressed at a constant temperature, the pressure P and volume V satisfy the equation $PV = c$, where c is a constant. Suppose that at a certain instant the volume is 62 cubic centimeters, the pressure is 11 kPa, and the pressure is increasing at a rate of 3 kPa/min. At what rate is the volume decreasing at this instant?

Possibilities:

(a) $\frac{183}{11}$ cubic centimeters per minute

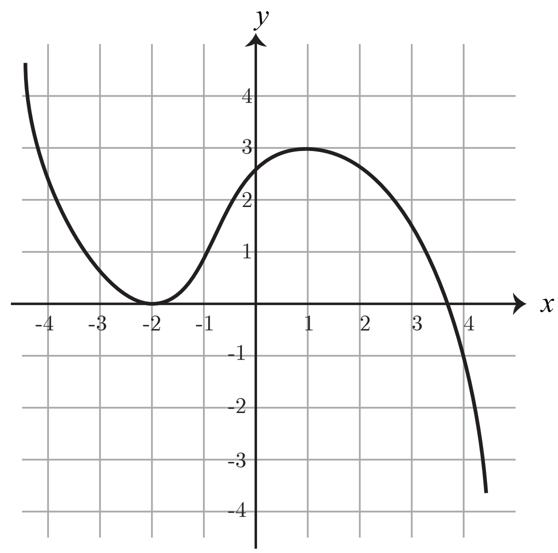
(b) $\frac{184}{11}$ cubic centimeters per minute

(c) $\frac{185}{11}$ cubic centimeters per minute

(d) $\frac{186}{11}$ cubic centimeters per minute

(e) 17 cubic centimeters per minute

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



Possibilities:

(a) 3

(b) -2

(c) 4

(d) -1

(e) 1

20. Find the minimum value of $g(t) = t^3 - 48t + 90$ on the interval $[-2, 5]$.

Possibilities:

(a) 218

(b) -38

(c) -25

(d) -36

(e) 178

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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