MA123 — Elem. Calculus Fall 2015
Exam 2 2015-10-22

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)

Fall 2015 Exam 2 Short Answer Questions

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

4 pts 1. Find the **derivative** of $f(x) = x^3 \ln(8x+1)$. Do **NOT** simplify your answer.

6 pts 2. A cylindrical water tank with its circular base parallel to the ground is being filled at the rate of 8 cubic feet per minute. The radius of the tank is 7 feet. How fast is the level of the water in the tank rising when the tank is half full?

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 $f(x) = x^3 + 2x^2 + 3x + 4$, find the equation of the tangent line to graph of f at $x = 2$.

   Possibilities:

   (a) $y = 23x - 20$

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

   (c) $y = 26x - 29$

   (d) $y = 23x + 26$

   (e) $y = 26$

---

4. Find the derivative, $f'(x)$, if $f(x) = \sqrt{4x^3 + 5x^2 + 6x + 2}$.

   Possibilities:

   (a) $(1/2)(4x^3 + 5x^2 + 6x + 2)(12x^2 + 10x + 6)$

   (b) $\sqrt{12x^2 + 10x + 6}$

   (c) $(1/2)(4x^3 + 5x^2 + 6x + 2)^{1/2}$

   (d) $\dfrac{\sqrt{12x^2 + 10x + 6}}{\sqrt{4x^3 + 5x^2 + 6x + 2}}$

   (e) $(1/2)(4x^3 + 5x^2 + 6x + 2)^{-1/2}(12x^2 + 10x + 6)$

---

5. Find the derivative, $f'(x)$, if $f(x) = e^{4x^3+5x^2+6x+2}$.

   Possibilities:

   (a) $(12x^2 + 10x + 6)e^x$

   (b) $\dfrac{12x^2 + 10x + 6}{4x^3 + 5x^2 + 6x + 2}$

   (c) $(12x^2 + 10x + 6)e^{4x^3+5x^2+6x+2}$

   (d) $e^{12x^2+10x+6}$

   (e) $\ln(4x^3 + 5x^2 + 6x + 2)$

---

6. Suppose $F(x) = g(x) \cdot h(x+2)$. If $g(0) = 6$, $g'(0) = 9$, $h(0) = 8$, $h'(0) = 3$, $h(2) = 4$, and $h'(2) = 7$, find $F'(0)$.

Possibilities:

(a) 37

(b) 120

(c) 102

(d) 27

(e) 78

---

7. Suppose $g(8) = -6$ and $g'(8) = -2$. Find $F'(8)$ if

$$F(x) = \frac{g(x)}{x^2}$$

Possibilities:

(a) $-\frac{1}{16}$

(b) $\frac{1}{128}$

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

(d) $-\frac{1}{128}$

(e) $-\frac{1}{4}$

---

8. Suppose $F(x) = (g(x))^3 + 13$. If $g(2) = 9$, $g'(2) = 7$, and $g''(2) = 5$, then find $F'(2)$.

Possibilities:

(a) $(3)(9^2) + 13$

(b) $9^3 + 13$

(c) $(3)(9^2)(7)$

(d) $7^3 + 13$

(e) 5

---

9. Suppose $F(x) = \ln(g(x))$. If $g(2) = 11$, $g'(2) = 7$, and $g''(2) = 5$, then find $F'(2)$.

Possibilities:

(a) $\ln(11)/7$

(b) $11/\ln(7)$

(c) $11/7$

(d) $\ln(5)$

(e) $7/11$

---

10. For the function $f(x) = \begin{cases} x^2 - 9 & x < 10 \\ \sqrt{x+4} & 10 \leq x < 20 \\ x^3 - 8 & 20 \leq x \end{cases}$, find the equation of the tangent line to the graph of f at $x = 26$.

Possibilities:

(a) $y = 667x - 4617$

(b) $y = 2028x - 35160$

(c) $y = \frac{1}{60}\sqrt{30}x + \frac{17}{30}\sqrt{30}$

(d) $y = \sqrt{30}x - \frac{419}{60}\sqrt{30}$

(e) $y = 52x - 685$

---

11. Find the derivative, $f'(x)$, if $f(x) = (6 + 5x)\ln(4 + 8x)$.

Possibilities:

(a) $\dfrac{5}{4+8x}$

(b) $1/x$

(c) $(5)\ln(4+8x) + \dfrac{48+40x}{4+8x}$

(d) $\dfrac{13}{4+8x}$

(e) $5 + \dfrac{8}{4+8x}$

---

12. If $f(x) = 7x^4 + 5x^2 + 6x$ then find the second derivative $f''(x)$:

Possibilities:

(a) $84x^2 + 24$

(b) $28x^3 + 10x + 6$

(c) $28x^3 + 42x^2 + 38x + 18$

(d) $112x^4 + 20x^2$

(e) $84x^2 + 10$

---

13. If $f(x) = (14x + 36)^{27}$ then $f''(x) =$

Possibilities:

(a) $27^2\,(14)^{27}\,(14x + 36)$

(b) $27(26)\,(14x + 36)^{25}\,(14)^2$

(c) $27\,(14x + 36)^{26}$

(d) 0

(e) $27(26)14^{25}$

---

14. Find the derivative, $f'(x)$, of $f(x) = \frac{1}{x^{10}}$

Possibilities:

(a) $1/(10\,x^{11})$

(b) $-10x^{-11}$

(c) $10x^9$

(d) $1/(10\,x^9)$

(e) $-10x^{-9}$

---

15. How many years will it take an investment to triple in value if the interest rate is 5% compounded continuously?

Possibilities:

(a) 12.21 years

(b) 13.73 years

(c) 15.69 years

(d) 18.31 years

(e) 21.97 years

16. The numbers of a bacteria in a culture doubles every 13 hours. How many hours will it take before 9 times the original number of bacteria is present?

Possibilities:

(a) $13 \ln(2)/\ln(9)$

(b) $\frac{13}{9}$

(c) $\frac{117}{2}$

(d) $13 \ln(9)/\ln(2)$

(e) $\frac{13}{2}$

17. A ladder 20 feet long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 2 feet per second, how fast is the top of the ladder sliding down the wall (in feet per second) when the bottom of the ladder is 16 feet from the wall?

Possibilities:

(a) $\frac{4}{3}$ feet per second

(b) $\frac{6}{5}$ feet per second

(c) $\frac{10}{3}$ feet per second

(d) $\frac{8}{3}$ feet per second

(e) $\frac{8}{5}$ feet per second

18. A farmer currently has harvested 270 bushels of turnip greens that are currently worth \$12.11 per bushel. The way things are going, he expects to be harvesting 4.00 bushels per day, and expects the price to be increasing at \$0.50 per bushel per day. What is the instantaneous rate of change (measured in dollars per day) of the total value of his turnip greens?

Possibilities:

(a) \$183.43 per day

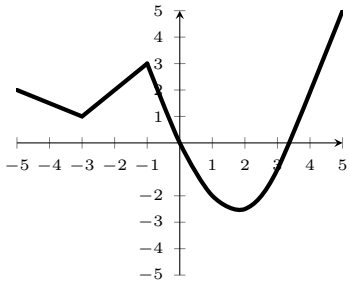
(b) \$183.44 per day

(c) \$183.45 per day

(d) \$183.46 per day

(e) \$183.47 per day

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



Possibilities:

(a) 7

(b) -1

(c) -3

(d) 2

(e) 0

20. Find the maximum of $g(t) = (t + 1)^2 - 4$ on the interval $[-2, 1]$

Possibilities:

(a) -3

(b) 2

(c) 0

(d) -4

(e) -1

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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