MA123 — Elem. Calculus Spring 2016
Exam 2 2016-3-10

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 2016 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 $f(x)=\dfrac{2x+4}{9x+7}$. **Do <u>NOT</u>** simplify your answer.

6 pts 2. The demand function q for a certain product is given by $q=3000e^{-0.004p}$, where p denotes the price of the product. If the item is currently selling for \$450 per unit, and the quantity supplied is decreasing at a rate of 80 units per week, find the rate at which the price of the product is changing.

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 $x = 1$.

   Possibilities:

   (a) $y = 10x + 10$

   (b) $y = 10$

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

   (d) $y = 10x$

   (e) 6

---

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

   Possibilities:

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

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

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

   (d) $\sqrt[5]{12x^2 + 10x + 6}$

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

---

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

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

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

---

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

Possibilities:

(a) 9

(b) 17

(c) 45

(d) 56

(e) 65

---

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

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

Possibilities:

(a) $-\frac{84}{25}$

(b) $\frac{84}{25}$

(c) $-\frac{7}{3}$

(d) $-\frac{84}{5}$

(e) $\frac{4}{5}$

---

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

Possibilities:

(a) $(3)(20^2)$

(b) $(3)(22)^2(7)$

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

(d) $(3)(7)^2$

(e) $9^3 + 13$

---

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) $7/11$

(e) $\ln(5)$

---

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 slope of the tangent line to the graph of f at $x = 16$.

Possibilities:

(a) $\sqrt{20}$

(b) 768

(c) $\frac{1}{40}\sqrt{20}$

(d) 247

(e) 32

---

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

Possibilities:

(a) $(5)\ln(4 + 8x) + \dfrac{6 + 5x}{x}$

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

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

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

(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) $84x^2 + 10$

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

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

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

---

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

Possibilities:

(a) $(14x + 36)(14x + 35)e^{14x+34} + 14e^{14x+35}$

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

(c) $14^2 e^{14x+36}$

(d) $(14x + 36)(14x + 35)e^{14x+34}$

(e) 0

---

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

Possibilities:

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

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

(c) $10x^9$

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

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

---

15. If \$5000 dollars is invested at 4% interest compounded continuously, what is the value of the investment at the end of 7 years?

Possibilities:

(a) \$1400.00

(b) \$3778.92

(c) \$6615.65

(d) \$36428.38

(e) \$82223.23

16. The number of a bacteria in a culture triples every 13 hours. How many hours will it take before 10 times the original number of bacteria is present?

Possibilities:

(a) $13 \ln(3)/\ln(10)$

(b) $\frac{13}{10}$

(c) $\frac{130}{3}$

(d) $\frac{13}{3}$

(e) $13 \ln(10)/\ln(3)$

17. Two birds leave the same tree at different times, one traveling due East, and the other traveling due North. At 2pm the eastbound bird is traveling at 25 mph and is 40 miles from the tree, while the northbound bird is traveling at 20 mph and is 30 miles from the tree. At what rate is the distance between the birds increasing?

Possibilities:

(a) 32 mph

(b) 50 mph

(c) 45 mph

(d) $5\sqrt{41}$ mph

(e) 3200 mph

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 49 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) 13 cubic centimeters per minute

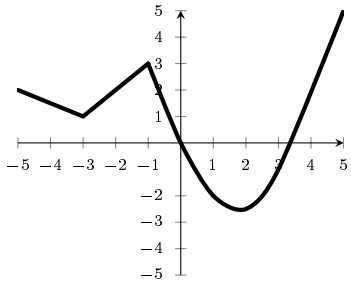
(b) $\frac{144}{11}$ cubic centimeters per minute

(c) $\frac{145}{11}$ cubic centimeters per minute

(d) $\frac{146}{11}$ cubic centimeters per minute

(e) $\frac{147}{11}$ cubic centimeters per minute

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) -1

(b) -3

(c) 7

(d) 2

(e) 0

20. Find the minimum of $g(t) = -(t + 2)^2 + 7$ on the interval $[-3, 0]$

Possibilities:

(a) 7

(b) 6

(c) -2

(d) 3

(e) 0

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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