MA123 — Elem. Calculus Fall 2017
Exam 2 2017-10-19

Name: _____ **Sec.:** _____

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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 2017 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. Find the derivative of $h(x) = e^{4x^3+9\ln x}$. **Do <u>*NOT*</u>** simplify your answer. Clearly (circle) your final answer.

2. Boyle's Law states that when a sample gas is compressed at a constant temperature, the pressure P and the volume V satisfy the equation $PV = c$, where c is a constant. Suppose that at a certain instant the volume is 700 cm^3, the pressure is 300 kPa, and the volume is increasing at a rate of 4 cm^3 per minute. At what rate is the pressure decreasing at this instant? (**<u>Show steps clearly</u>** 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 $f(x) = 7x^3 + 8x^2 + 5x + 9$, find the equation of the tangent line to the graph of f at $x = 2$.

Possibilities:

(a) $y = 107x - 93$

(b) $y = 107$

(c) $y = 121x - 135$

(d) $y = 121x + 107$

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

---

4. Find the derivative, $f'(x)$, if $f(x) = \sqrt[5]{6x^3 + 7x^2 + 8x + 4}$.

Possibilities:

(a) $(1/5)(6x^3 + 7x^2 + 8x + 4)(18x^2 + 14x + 8)$

(b) $\sqrt[5]{18x^2 + 14x + 8}$

(c) $(1/5)(6x^3 + 7x^2 + 8x + 4)^{-1/5}$

(d) $(1/5)(6x^3 + 7x^2 + 8x + 4)^{-4/5}(18x^2 + 14x + 8)$

(e) $\dfrac{\sqrt[5]{18x^2 + 14x + 8}}{\sqrt[5]{6x^3 + 7x^2 + 8x + 4}}$

---

5. Find the derivative, $f'(x)$, if $f(x) = (80x + 70)\ln(9x + 5)$.

Possibilities:

(a) $80 \cdot \frac{9}{9x+5}$

(b) $(80x + 70) \cdot \frac{1}{9x+5} + 80\ln(9x + 5)$

(c) $80\ln(9x + 5)$

(d) $9e^{9x+5} + 80$

(e) $(80x + 70) \cdot \frac{9}{9x+5} + 80\ln(9x + 5)$

---

6. Suppose $F(x) = (x+6)e^{g(x)}$. If $g(9) = 0$, and $g'(9) = 8$, find $F'(9)$.

Possibilities:

(a) 120

(b) 16

(c) 121

(d) 0

(e) 8

---

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

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

Possibilities:

(a) $-\frac{161}{6}$

(b) $-\frac{161}{36}$

(c) $-\frac{23}{7}$

(d) $\frac{161}{36}$

(e) $\frac{5}{6}$

---

8. Suppose $H(x) = \sqrt{f(x) + g(x)}$. If $f(8) = 4$, $f'(8) = 7$, $g(8) = 45$, and $g'(8) = 6$, find $H'(8)$.

Possibilities:

(a) $\frac{1}{14}$

(b) $\frac{1}{26}\sqrt{13}$

(c) $\sqrt{13}$

(d) $\frac{637}{2}$

(e) $\frac{13}{14}$

---

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) $7/11$

(c) $11/7$

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

(e) $\ln(5)$

---

10. For the function $f(x) = \begin{cases} x^2 - 9 & x < 10 \\ x^3 - 8 & 10 \leq x < 20 \\ \sqrt{x+4} & 20 \leq x \end{cases}$, find the slope of the tangent line to the graph of f at $x = 16$.

Possibilities:

(a) 768

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

(c) 4088

(d) 247

(e) 32

---

11. Find the derivative, $f'(x)$, if $f(x) = e^{\sqrt{9+5x}}$.

Possibilities:

(a) $e^{\left(\frac{\frac{5}{2}}{\sqrt{9+5x}}\right)}$

(b) $\frac{\frac{\frac{5}{2}}{\sqrt{9+5x}}}{\sqrt{9+5x}}$

(c) $\left(\frac{\frac{5}{2}}{\sqrt{9+5x}}\right) e^{\sqrt{9+5x}}$

(d) $\left(\frac{\frac{5}{2}}{\sqrt{9+5x}}\right) e^{x}$

(e) $\ln(\sqrt{9+5x})$

---

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

Possibilities:

(a) $672x^5 + 17x$

(b) $\dfrac{16x^7 + 14x + 8}{x^2}$

(c) $1024x^8 + 56x^2$

(d) $672x^5$

(e) $112x^6 + 14$

---

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

Possibilities:

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

(b) 0

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

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

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

---

14. Find the derivative, $f'(x)$, of $f(x) = \frac{1}{x^{60}}$

Possibilities:

(a) $1/(60\,x^{59})$

(b) $-60x^{-59}$

(c) $-60x^{-61}$

(d) $60x^{59}$

(e) $1/(60\,x^{61})$

---

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. The number of bacteria in a culture doubles every 7 hours. If we begin with 1000 cells, about how many cells do we have after 10 hours?

Possibilities:

(a) 1625 cells

(b) 2857 cells

(c) 16,807,000 cells

(d) 4804 cells

(e) 2692 cells

17. A circle is growing so its area is increasing at a rate of 91 square feet per minute. At what rate is the radius changing when its radius is 5 feet?

Possibilities:

(a) 910π feet per minute

(b) $\frac{10\pi}{91}$ feet per minute

(c) $\frac{91}{10\pi}$ feet per minute

(d) $\frac{91}{25\pi}$ feet per minute

(e) $\frac{91}{5\pi}$ feet per minute

---

18. It is estimated that the annual advertising revenue received by a certain newspaper will be

$$R(x) = 0.5x^2 + 9x + 195$$

thousand dollars when its circulation is x thousand. The circulation of the paper is currently 17000 and is increasing at a rate of 2000 papers per year. At what rate will the annual advertising revenue be increasing with respect to time 3 years from now?

Possibilities:

(a) \$52000.00 per year

(b) \$64000.00 per year

(c) \$492.50 per year

(d) \$5500.00 per year

(e) \$45900.00 per year

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:

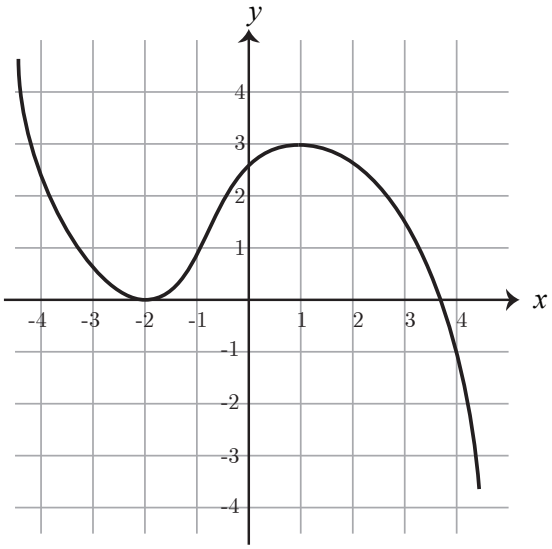
(a) 3

(b) -1

(c) -2

(d) 1

(e) 4



20. Find the minimum value of $g(t) = t^3 - 48t + 70$ on the interval $[-2, 5]$.

Possibilities:

(a) -45

(b) 198

(c) 158

(d) -58

(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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