

Do not remove this answer page — you will turn in the entire exam. No books or notes may be used. You may use an ACT-approved calculator during the exam, but NO calculator with a Computer Algebra System (CAS), networking, or camera is permitted. Absolutely no cell phone use during the exam is allowed.

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GOOD LUCK!

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For grading use:

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

Total	
	(out of 100 points)

Spring 2019 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.

1. Let $H(x) = e^{g(x)} f(3x^2 + 10)$. Find the derivative, $H'(x)$. **DO NOT SIMPLIFY** your answer. Clearly **circle** your final answer.

2. The cost function and revenue function (in dollars) for the production and sale of x espresso machines are given as $C(x) = 46000 + 50x$ and $R(x) = 285x - \frac{x^2}{80}$.

Find and simplify the **profit function** and the **marginal profit function**. Circle both of your final answers.

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 $f(x) = 7x^3 + 8x^2 + 9x + 5$, find the equation of the tangent line to the graph of f at $x = 2$.

Possibilities:

- (a) $y = 111x - 97$
 - (b) $y = 125x + 111$
 - (c) $y = 111$
 - (d) $y = x^3 + 17$
 - (e) $y = 125x - 139$
-

4. Find the derivative, $f'(x)$, if $f(x) = \sqrt[5]{6x^3 + 8x^2 + 9x + 7}$.

Possibilities:

- (a) $(1/5)(6x^3 + 8x^2 + 9x + 7)^{-1/5}$
 - (b) $(1/5)(18x^2 + 16x + 9)^{-4/5}$
 - (c) $(1/5)(6x^3 + 8x^2 + 9x + 7)(18x^2 + 16x + 9)$
 - (d) $(1/5)(6x^3 + 8x^2 + 9x + 7)^{-4/5}(18x^2 + 16x + 9)$
 - (e) $\sqrt[5]{18x^2 + 16x + 9}$
-

5. Find the derivative, $f'(x)$, if $f(x) = 8e^{18x} + 17x^e$.

Possibilities:

- (a) $8e^{18x} + 17x^e$
 - (b) $\frac{8}{18} \ln(18x) + 17ex^{e-1}$
 - (c) $144e^{18x} + 17ex^{e-1}$
 - (d) $8 \ln(18x) + 17ex^{e-1}$
 - (e) $144xe^{18x-1} + 17ex^{e-1}$
-

6. Suppose $F(x) = e^x g(19x + 18)$. Find $F'(0)$, given that $g(0) = 9$, $g'(0) = 20$, $g(18) = 17$, $g'(18) = 16$.

Possibilities:

- (a) 16
- (b) 321
- (c) 339
- (d) 19
- (e) 389

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

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

Possibilities:

- (a) $-\frac{77}{9}$
- (b) $\frac{77}{9}$
- (c) $-\frac{44}{7}$
- (d) $-\frac{154}{3}$
- (e) $\frac{4}{3}$

8. Suppose $H(x) = \sqrt{f(x) + g(x)}$. If $f(9) = 7$, $f'(9) = 8$, $g(9) = 42$, and $g'(9) = 6$, find $H'(9)$.

Possibilities:

- (a) 343
- (b) 1
- (c) $\frac{1}{28}\sqrt{14}$
- (d) $\sqrt{14}$
- (e) $\frac{1}{14}$

9. Suppose $F(x) = \ln(g(x))$. If $g(2) = 11$, $g'(2) = 19$, and $g''(2) = 7$, then find $F'(2)$.

Possibilities:

- (a) $11/\ln(19)$
- (b) $\ln(11)/19$
- (c) $\ln(7)$
- (d) $19/11$
- (e) $11/19$

10. For the function $f(x) = \begin{cases} x^2 - 9 & x < 3 \\ x^3 - 4 & 3 \leq x < 7 \\ x^{-2} & 7 \leq x \end{cases}$, find the slope of the tangent line to the graph of f at $x = 15$.

Possibilities:

- (a) 216
- (b) $-\frac{2}{3375}$
- (c) 675
- (d) $\frac{1}{225}$
- (e) 30

11. Find the derivative, $f'(x)$, if $f(x) = \ln(\ln(7 + 9x))$.

Possibilities:

- (a) $\frac{1}{\ln(\ln(7 + 9x))} \cdot \frac{1}{\ln(7 + 9x)} \cdot \frac{9}{7 + 9x}$
- (b) $\frac{1}{\frac{1}{7 + 9x}}$
- (c) $\left(\frac{9}{7 + 9x}\right) e^{\ln(7 + 9x)}$
- (d) $e^{\frac{9}{7 + 9x}}$
- (e) $\frac{1}{\ln(7 + 9x)} \cdot \frac{9}{7 + 9x}$

12. If $f(x) = x^7 + 2x^6 + 9x$ then find the third derivative $f'''(x)$:

Possibilities:

- (a) $210x^4 + 240x^3$
- (b) $210x^4 + 240x^3 + 12x$
- (c) $\frac{7x^6 + 12x^5 + 9}{x^2}$
- (d) $343x^7 + 432x^6$
- (e) $42x^5 + 60x^4$

13. If $f(x) = (17x + 38)^{27}$ then $f''(x) =$

Possibilities:

- (a) $27^2 (17)^{27} (17x + 38)$
- (b) $27(26)17^{25}$
- (c) $27(26) (17x + 38)^{25} (17)^2$
- (d) 0
- (e) $27 (17x + 38)^{26}$

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

Possibilities:

- (a) $-60x^{-61}$
 - (b) $-60x^{-59}$
 - (c) $60x^{59}$
 - (d) $1/(60 x^{59})$
 - (e) $1/(60 x^{61})$
-

-
15. If \$7000 dollars is invested at 6% annual interest compounded continuously, what is the value of the investment at the end of 3 years?

Possibilities:

- (a) \$5846.89
- (b) \$8260.00
- (c) \$8380.52
- (d) \$12600.00
- (e) \$42347.53

-
16. A bacteria culture starts with 8000 bacteria and triples after 13 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) $8000/\ln(3)$
- (b) $\ln(3)/\ln(13)$
- (c) 8000
- (d) $\ln(3)/13$
- (e) $13/\ln(3)$

-
17. A drug is injected into the bloodstream of a patient. The concentration of the drug in the bloodstream (in milligrams per cubic centimeter) t hours after the injection is given by

$$C(t) = \frac{.21t}{t^2 + 7}$$

Find the instantaneous rate of change of the drug concentration with respect to time at $t = 1$ hour.

Possibilities:

- (a) 0.020 units per hour
- (b) 0.026 units per hour
- (c) 0.105 units per hour
- (d) 6.000 units per hour
- (e) 33.333 units per hour

-
18. The price-demand function for the production of x microwaves is given as

$$p = 230 - \frac{x}{60}.$$

Evaluate the **marginal revenue** function at $x = 1000$.

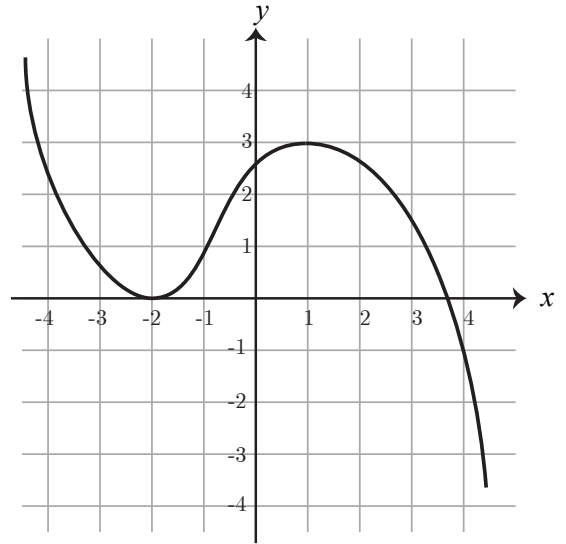
Possibilities:

- (a) \$ - 16.67
- (b) \$196.67
- (c) \$213333.33
- (d) \$213.33
- (e) \$ - 1770.00

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

Possibilities:

- (a) 4
- (b) 3
- (c) -1
- (d) -2
- (e) 1



20. Find the minimum value of $g(x) = x^3 + 9x^2 + 170$ on the interval $[-1, 5]$.

Possibilities:

- (a) 164
- (b) 278
- (c) 178
- (d) 520
- (e) 170

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