Part A: True/False. Circle the correct answer. (5 pts each)

1. **T** **F** The derivative does not exist at a hole (or break), a sharp corner, or a vertical tangent.

2. **T** **F** A critical value of $f(x)$ is any value of x for which $f'(x) = 0$, or $f'(x)$ is not defined.

Part B: Multiple choice. Circle the correct answer. (5 pts each)

3. The equation of the tangent line to the curve $f(x) = e^{2x} + 5x + 1$ at $x = 0$ is

   a) $y = 7x + 7$ b) $y = 7x + 2$ c) $y = 6x + 2$ d) $y = 6x + 7$

   e) None of these. The correct answer is: _____

4. If \$300 is invested at $5\frac{1}{4}\%$ compounded continuously for six months, the balance will be

   a) \$307.98 b) \$411.08 c) \$4141.37 d) \$307.81

   e) None of these. The correct answer is: _____

5. The derivative of $f(x) = \log_2 (3x + 5)^9$ is

   a) $f'(x) = \dfrac{27 \cdot \ln 2}{3x + 5}$ b) $f'(x) = \dfrac{9(3x + 5)^8 \cdot 3}{(3x + 5)^9}$ c) $f'(x) = \dfrac{9(3x + 5)^8}{(3x + 5)^9}$

   d) $f'(x) = \dfrac{27}{(3x + 5) \cdot \ln 2}$ e) None of these. The correct answer is: _____

6. The derivative of $f(x) = 5^{x^2}$ is

a) $f'(x) = 5^{2x} \ln 5$ b) $f'(x) = \dfrac{5^{x^2}(2x)}{\ln 5}$ c) $f'(x) = 5^{x^2}(2x) \ln 5$ d) $f'(x) = \dfrac{5^{2x}(2)}{\ln 5}$

e) None of these. The correct answer is: _____

7. Which of the following choices for $f(x)$ and $g(x)$ defined below, will substitute into the function $h(x) = (f \circ g)(x)$ or $h(x) = f(g(x))$ when $h(x) = \sqrt{\dfrac{x}{x+1}}$

i) $f(x) = \sqrt{x}$, $g(x) = \dfrac{x}{x+1}$

ii) $f(x) = \dfrac{x}{x+1}$, $g(x) = \sqrt{x}$

iii) $f(x) = \sqrt{\dfrac{x+3}{x+4}}$, $g(x) = x - 3$

a) only i b) only ii c) only i and iii d) only ii and iii

e) None of these. The correct answer is: _____

8. Find $f'(5)$ given $f(x) = \dfrac{e^{2x}}{g(x)}$. $g(5) = 2$, $g'(5) = -8$.

a) $f'(x) = 3e^{10}$ b) $f'(x) = 2.5e^{10}$ c) $f'(x) = 2e^{10}$ d) $f'(x) = 4e^{10}$

e) None of these. The correct answer is: _____

9. Find $f'(x)$ if $f(x) = \dfrac{4x - x^2}{e^x}$

a) $f'(x) = \dfrac{-x^2 + 6x - 4}{e^{2x}}$ b) $f'(x) = \dfrac{x^2 - 6x + 4}{e^x}$ c) $f'(x) = \dfrac{x^2 - 6x + 4}{e^{2x}}$ d) $f'(x) = \dfrac{4 - 2x}{e^x}$

e) None of these. The correct answer is: _____

10. Determine the interval(s) over which $f(x) = 4x^3 + 3x^2 - 2x + 5$ is concave upward.

a) $(-\infty, -\frac{1}{2})$

b) $(-\frac{1}{2}, \infty)$

c) $(-\infty, -\frac{1}{4})$

d) $(-\frac{1}{4}, \infty)$

e) none of these

Part C: Work Out. Show all steps for partial credit.

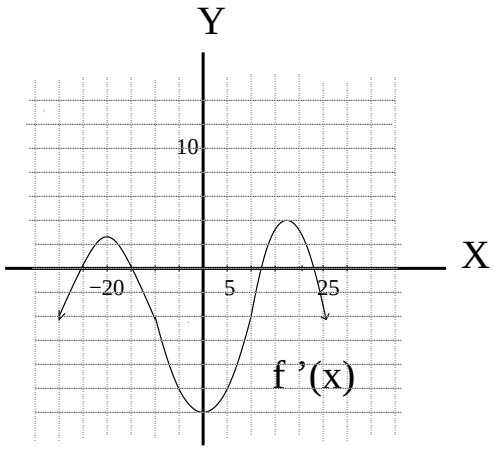
11. (12 pts) The total cost of producing x patio enclosures is approximated by the function $C(x) = 42x - 0.5x^2$, where x represents the number of patios enclosed each month, and $C(x)$ is measured in hundreds of dollars.

a) What is the **average rate of change** in cost from building 4 patios to building 8 patios in one month?

b) Find the marginal average cost function.

c) Estimate the cost of the 10^{th} patio enclosure.

12. (12 pts) Given the graph of $f'(x)$ below:



a) Over what interval(s) if $f(x)$ increasing?

b) For what value(s) of x, does $f(x)$ have a relative minimum?

c) Over what interval(s) is $f(x)$ concave up?

13. (6 pts) Suppose the concentration **c**, of a drug in the bloodstream t hours after taken orally is given by $c = \dfrac{6t}{t^2+1}$. After 2 hrs is the concentration increasing or decreasing?

14. (10 pts) The demand function for season tickets to the Aggie Soccer games is modeled by

$5x + 250p = 3000$, for $0 < x < 16.5$ where x is the number of hundreds of tickets sold, and p is measured in dollars.

a) Find the elasticity of demand function.

b) Is a price of \$4, elastic, inelastic, or of unit elasticity?

c) If the price is **CHANGED** 20%, what change will result in the demand?

Bonus) (3 pts) Over what interval is the price **elastic**?

15. (5 pts) Use the limit definition of the derivative techniques and the fact that

$$f(x+h) - f(x) = \frac{2h + h^2}{(x+h-2)(x-2)}$$ to find the value of $f'(5)$

16. (5pts) Find the critical value(s) of $f(x) = \dfrac{x^3 - 4x^2 - 32x}{x}$

	possible	earned
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TOTALS	100	

Grade