Name: _______________________________ Date:_______________ **Corrective Assignment**

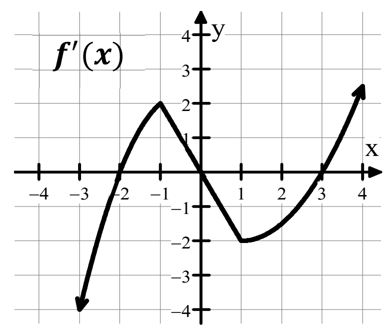
Mid-Unit 5 CA – Analytical Applications of Differentiation

1. Apply the Mean Value Theorem to $y = x^3 - 2x^2 - 3$ to find when the instantaneous rate of change will equal the average rate of change on the interval $[0, 2]$

2. **Calculator active problem.** The first derivative of the function f is given by $f'(x) = \frac{\cos^2 x}{x} - \frac{1}{5}$. How many critical values does f have on the open interval $(0, 10)$?

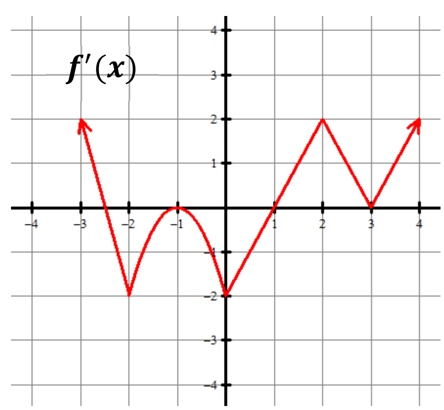
(A) One (B) Three (C) Four (D) Five (E) Seven

3. The graph shows the derivative of f, f'. Identify the intervals when f is increasing and decreasing. Include a justification statement.



Increasing: Decreasing:

4. The graph of f', the derivative of f, is shown. Find the x-value of each relative maximum and minimum.



Relative Maximum(s) at

Relative Minimum(s) at

5. Use the First Derivative Test to help you find the relative minimum value of $f(x) = x \ln x$. What is this value?

6. What is the absolute maximum value of the function $g(x) = 2x^3 + \frac{3}{2}x^2 - 3x - 10$ on the closed interval $[-2, 2]$.

7. Use the 2nd Derivative Test to find the x-value(s) of all relative extrema of the function $f(x) = 2\sin x + \sqrt{2}x$ on the interval $[0, 2\pi]$. Justify your answer.

8. **Calculator active problem.** A local wild boar population is changing at a rate modeled by
$$b(t) = 0.04t^4 - 0.25t^2 - 0.02t$$
boar per year where t is measured in years. Is the boar population growing or shrinking at time $t = 3$ years? Justify your answer.

9. **Calculator active problem.** The derivative of g is given by $g'(x) = \cos(4x^2)$ for $0 \leq x \leq 1.5$. On what interval(s) is g decreasing?

10. **Calculator active problem.** The function f has first derivative given by $f'(x) = \sqrt{x} - \frac{e^x}{x}$. What is the x-coordinate of the inflection point of the graph of f?

ANSWERS to Mid-Unit 5 Corrective Assignment

1. $\frac{4}{3}$	2. B. Three	3. Increasing: $(-2, 0)$ and $(3, \infty)$ because $f'(x) > 0$. Decreasing: $(\infty, -2)$ and $(0, 3)$ because $f'(x) < 0$.	4. Max at $x = -2.5$ Min at $x = 1$
5. $f(e^{-1}) = -\frac{1}{e}$ Min value is $-\frac{1}{e}$.	6. $g(-2) = -14$ $g(-1) = -7.5$ $g\left(\frac{1}{2}\right) = -10.875$ $g(2) = 6$ Absolute maximum value of 6.	7. Rel max at $x = \frac{3\pi}{4}$ because $f'\left(\frac{3\pi}{4}\right) = 0$ and $f''\left(\frac{3\pi}{4}\right) < 0$. Rel min at $x = \frac{5\pi}{4}$ because $f'\left(\frac{5\pi}{4}\right) = 0$ and $f''\left(\frac{5\pi}{4}\right) > 0$.	
8. $b(3) = 0.93$. $b(t)$ is the rate of change, therefore the population is increasing because $b(3) > 0$.	9. $0.6266 < x < 1.085$ and $1.401 < x < 1.5$	10. $x = 1.1978$	