1. (6 pts) Use the formal definition of limit to prove: $\lim_{x \to 6} (3x - 5) = 13$

2. (6 pts) Use the definition to compute the derivative of $f(x) = 5x^2$. Show all work.

3. (6 pts) Compute accurate to 2 decimal places using numerical or graphical methods: $\lim_{h \to 0} \frac{3h}{2^h - 1}$

4. (6 pts) Find the absolute minimum value of $f(x) = 2x + \frac{10}{x}$ on the interval [1, 4]

5. (6 pts) Find the equation of the tangent line to $f(x) = x^3 + 2x$ at $x = 1$. 
6. (6 pts) If you are given that \( \frac{dP}{dt} = -3 \) and the formula, \( P = \pi R^3 + 4R \). Find \( \frac{dR}{dt} \) when \( R = 2 \).

7. (20 pts) Compute the derivatives of **ALL** of the following:

   a. \( R = s^3 e^{-s} \)

   b. \( f(x) = \frac{\sec x}{x^2 + 1} \)

   c. \( P = \tan^{-1}(t^2 + 5) \)

   d. \( P = \ln(s^4 - 2s + 4) \)

8. (6 pts) Determine the **slope** of the graph of the equation: \( xy^2 + 2x = 3y \) at the point \((1,2)\)

9. (6 pts) Given the following equation: \( f'(x) = f(x) + 1 \), and \( f(1) = 3 \). Use differentials to estimate \( f(9) \).

\[ f(9) = \]
10. Let $f(x) = x^4 - 4x^2 - 2x$

a. (5 pts) Determine the **exact** $x$-coordinates of any inflection points.

b. (5 pts) Determine the intervals of **concave up** on the interval $(-\infty, \infty)$.

10. (6 pts) Determine the vertical and horizontal asymptotes of $f(x) = \frac{4x + 1}{x^2 - 1}$.

Vertical asymptote(s): _____________

Horizontal asymptote(s): _____________

11. (12 pts) Given the graph of $f(x)$, below, answer the following questions.

A) How many inflection points are there? _____________

B) What are the intervals of increasing? _____________

J) If $x_5$ is the starting point, illustrate Newton’s method by drawing the appropriate tangent line on the graph above.

J) If $x_5$ is the starting point in Newton’s method, what $x$-value will the method converge to? _____________
SHOW EACH AND EVERY STEP--THE FINAL (word) ANSWER ALONE IS WORTH VERY FEW POINTS!!

12. (4 parts, 3 pts each) A balloon is rising vertically at a constant speed of 8 ft/s. A girl is cycling along a horizontal straight road at a speed of 15 ft/s. When she passes under the balloon, the balloon is 45 ft above her. How fast is the distance between the girl and the balloon changing 5 seconds later?