You must show your work for your answer to be considered valid. Mark the final answer by putting it in a box or circle.

1. (6 pts each) Determine the domain of the functions below.
   
   (a) \( f(x) = \frac{\sqrt{40 - x}}{x - 3} \).
   
   (b) \( g(y) = \sqrt{y + 5} - \sqrt{\frac{1}{y - 1}} \).

2. (7 pts) Simplify the difference quotient \( \frac{f(x + h) - f(x)}{h} \) for \( f(x) = x^3 \).

3. (7 pts) Graph the function \( f(x) = x^2 - 4x - 5 \), find the \( y \)-intercept, the \( x \)-intercepts and determine the minimum value that \( f \) attains.

4. (6 pts each) Compute the limits below (justify steps).
   
   (a) \( \lim_{x \to 2} \frac{x^2 + 9}{x^3 + 3x} \)
   
   (b) \( \lim_{x \to +\infty} \frac{x^2 + 4x + 2}{3x^2 + 9x + 100} \)
   
   (c) \( \lim_{x \to 1} \sqrt{x + \sqrt{x}} \)

5. (10 pts) Consider the function
   
   \[ f(x) = \begin{cases} 
   x^2 + 137432954x - 2, & \text{if } x > 0 \\
   4x - 2, & \text{if } x \leq 0.
   \end{cases} \]

   Determine the values of \( x \) for which \( f \) is continuous (justify). Is there a value of \( x \) between \(-10\) and \(1\) for which \( f(x) = 2010 \)?
6. (2 + 5 + 3 pts) Find the derivative of \( f(x) = \sqrt{x} \). Determine the equation of the line tangent to the graph of \( f \) when \( x = 4 \). Use the linear equation to approximate the value of \( \sqrt{4.01} \). (The actual value of \( \sqrt{4.01} \) is 2.00249843945...)

7. (7 pts each) Compute the derivatives of the functions below.
   
   (a) \( f(x) = 3x^3 - 6x + 9 + \sqrt{x} \)
   
   (b) \( g(x) = \frac{x+5}{x^2+2} \)

8. (7 pts) Compute the derivative of \( f(x) = (6x^2 + 4)(x^3 + 2x) \) using the product rule.

9. (9 + 6 pts) A company uses a truck to deliver its products. To estimate the costs the manager models fuel consumption by the function

   \[ G(x) = \frac{1}{250} \left( \frac{1200}{x} + x \right) \]

which gives the use of diesel in gal/mile assuming that the truck is driven at constant speed of \( x \) miles per hour \( (x \geq 5) \).

The driver is paid \$20/hour to drive 250 miles and diesel costs \$4/gallon.

- Find the cost function \( C(x) \). (Simplify the expression as much as possible.)
- At what rate is the cost \( C(x) \) changing with respect to \( x \) when the truck is driven at 40mph? Is the cost increasing or decreasing at that speed?