Name: ――――――――――――――――――――――――――   ――――― / 25

Circle one: **Faudree (F01)** | **Bueler (F02)** | **VanSpronsen (UX1)**

25 points possible. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit.

1. **[12 points]** Differentiate the functions. Write your answer using appropriate derivative notation, but you need not simplify your answers.

   a. $f(x) = \dfrac{3}{x^2}$

   b. $g(u) = u^{1/3} - u^{5/3}$

   c. $h(x) = x^{e-1} + \dfrac{1}{e^3}$

   d. $F(t) = \dfrac{at}{b + ct^2}$

   e. $s(t) = e^t (5 - t)$

2. [4 points] Suppose that $f(3) = 5$, $g(3) = -1$, $f'(3) = -4$, and $g'(3) = 3$. Find the following values.

    a. $(fg)'(3)$

    b. $\left(\dfrac{f}{g}\right)'(3)$

3. [6 points] The equation of motion of a particle is $s = t^4 - 2t^3 - 4$, where s is in meters and t is in seconds. **Include the units for each answer.**

    a. What is the acceleration as a function of t?

    b. Find the velocity at the time $t > 0$ when the acceleration is 0.

4. [3 points] For what value of x does the graph of $f(x) = 5e^x - 2x$ have a horizontal tangent?