INSTRUCTIONS: Calculators are allowed but show all work. Answers without work will NOT receive full credit. Clearly indicate your final answers. Point values are as marked. The maximum possible score is 60 points.

[5 pts] Find the indicated derivative of the function.

1) \( f''(x) \) of \( f(x) = \frac{x}{x + 1} \)

[5 pts] Find any open intervals where the function is concave upward.

2) \( f(x) = 4x^3 - 45x^2 + 150x \)

[5 pts] Use the Second Derivative Test to determine whether the given critical number for \( f(x) \) is a relative minimum, relative maximum, or neither.

3) \( f(x) = 4x^5 - 5x^4; \ x = 1 \)
[5 pts] Find the indicated absolute extremum as well as all values of x where it occurs on the specified domain.

4) \( f(x) = \frac{1}{3}x^3 - 2x^2 + 3x - 4; \ [-2, 5] \)

Minimum

[5 pts] Find \( \frac{dy}{dx} \) by implicit differentiation.

5) \( x^3 + 3x^2y + y^3 = 8 \)

[5 pts] Evaluate the indefinite integral.

6) \( \int (4t^2 + 5t - 5) \, dt \)
[5 pts] Evaluate the indefinite integral.
7) \( \int (9x^{-5} - 3x^{-1}) \, dx \)

[5 pts] Solve the problem.
8) Find \( C(x) \) if \( C'(x) = 5x^2 - 7x + 4 \) and \( C(6) = 260 \).

[10 pts] Solve the problem.
9) Boyle’s law states that if the temperature of a gas remains constant, then \( PV = c \), where \( P \) is the pressure, \( V \) is the volume, and \( c \) is a constant. Given a quantity of gas at constant temperature, if \( V \) is decreasing at a rate of \( 9 \) in.\(^3\)/s, at what rate is \( P \) increasing when \( P = 30 \) lb/in.\(^2\) and \( V = 70 \) in.\(^3\)?
[10 pts] Solve the problem.

10) The stadium vending company finds that sales of hot dogs average 39,000 hot dogs per game when the hot dogs sell for $2.50 each. For each 50 cent increase in the price, the sales per game drop by 5000 hot dogs. What price per hot dog should the vending company charge to realize the maximum revenue?