

Math 131 - Quiz 6

October 2, 2025

Name key

Score _____

Show all work to receive credit. Supply explanations where necessary.

1. (2 points) Let $h(x) = \frac{f(x) + g(x)}{x}$. Given the following information, compute $h'(2)$.

$$f'(0) = 7, \quad f(2) = -4, \quad f'(2) = 8, \quad g(0) = 0, \quad g(2) = -5, \quad g'(2) = 9$$

$$h'(x) = \frac{[f'(x) + g'(x)](x) - [f(x) + g(x)](1)}{x^2}$$

$$h'(2) = \frac{(8+9)(2) - (-4 + (-5))(1)}{4} = \frac{34 + 9}{4} = \boxed{\frac{43}{4}}$$

2. (3 points) Find $\frac{d^2y}{dx^2}$ when $y = 6x^3 - 4x^2 + \cos x$.

$$\frac{dy}{dx} = 18x^2 - 8x - \sin x$$

$$\boxed{\frac{d^2y}{dx^2} = 36x - 8 - \cos x}$$

3. (5 points) An object is launched vertically upward from over the edge of a building. The object's height (in meters) after t seconds is given by

$$s(t) = -4.9t^2 + 14.7t + 49.$$

Include units with your answer for each part of this problem.

- (a) Determine the average rate of change the object's height over the interval from $t = 0$ to $t = 3$.

$$\frac{\Delta s}{\Delta t} = \frac{s(3) - s(0)}{3 - 0} = \frac{49 - 49}{3} = \frac{0}{3} = \boxed{0 \text{ m/sec}}$$

- (b) Determine the object's velocity at time $t = 4$.

$$s'(t) = -9.8t + 14.7$$

$$s'(4) = -9.8(4) + 14.7 = \boxed{-24.5 \text{ m/sec}}$$

- (c) Determine the object's maximum height.

$$s'(t) = 0 \Rightarrow -9.8t + 14.7 = 0$$

$$t = \frac{14.7}{9.8} = 1.5 \text{ sec}$$

$$s(1.5) = -4.9(1.5)^2 + 14.7(1.5) + 49$$

$$= \boxed{60.025 \text{ m}}$$