MEMORIAL UNIVERSITY OF NEWFOUNDLAND DEPARTMENT OF MATHEMATICS AND STATISTICS

Section 2.3

Math 1000 Worksheet

Fall 2024

For practice only. Not to be submitted.

- 1. Differentiate each of the following functions without using the definition of derivative.
 - (a) $y = 2x^{\frac{3}{4}} \sqrt{3}$ (b) $f(x) = (2x)^{5}$ (c) $V(r) = \frac{4}{3}\pi r^{3}$ (d) $y = 4\sqrt{x} - \frac{2}{x^{3}} - x$ (e) $f(t) = (3t^{2} - 1)(t^{2} + 8t)$ (f) $g(x) = \frac{5x - 1}{2x}$
- 2. A pebble is thrown vertically downward from the roof of a tall building, 343 metres above the ground. If its initial velocity is -14.7 metres per second, its position after t seconds can be described by the function

$$s(t) = -4.9t^2 - 14.7t + 343.$$

What is the velocity of the pebble when it strikes the ground?

3. A certain object moves in a straight line such that its position varies *cubically*. This means that, after t seconds, its position in metres is given by a function of the form

$$s(t) = At^3 + Bt^2 + Ct + D.$$

It is known that the object is initially at rest and that its starting position is 0 metres. A measuring device positioned at -36 metres records the object's presence there twice, at 2 seconds and at 6 seconds.

- (a) Use calculus to determine the values of the constants A, B, C and D.
- (b) To two decimal places, find the moment at which the object is again at rest, and determine its position at this time.