

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.3

Math 1000 Worksheet

FALL 2025

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.