

## Workshop Exercises: Differentiation I

1. Use the definition of the derivative to find  $f'(-1)$ , where  $f(x) = 2x^2 + 1$ .
2. Use the definition of the derivative to find  $f'(x)$ , where  $f(x) = 2x^3 + 1$ .
3. Use the definition of the derivative to find  $f'(x)$ , where  $f(x) = \frac{1}{\sqrt{x-4}}$ .

4. Determine if the following function is differentiable at  $c = 0$  :

$$f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}.$$

5. Differentiate the following functions.

a)  $f(x) = 4x^3$ .

h)  $g(x) = \left(\frac{x^2}{2x-1}\right)^2$ .

b)  $g(x) = -2x^2 + 4x + 3$ .

i)  $h(x) = 4 \sin(x) \cos(x)$ .

c)  $h(x) = \frac{3}{x^2}$ .

j)  $h(x) = 2 \tan(4x)$ .

d)  $f(x) = 3\sqrt{x} - \pi x^2$ .

k)  $g(x) = x^2 \csc(2x)$ .

e)  $g(x) = (x^2 + 5)(2x^4 - 3)$ .

l)  $h(x) = \sec^3(3x)$ .

f)  $h(x) = (3x + 1)^2(x^2 + 2)$ .

m)  $f(x) = 2 \cot(\sin(3x^2))$ .

g)  $f(x) = \frac{3x-1}{x^2-2}$ .

n)  $g(x) = 2 \cot^2(\sin(3x^2))$ .

6. Find the equation of the line tangent to the function  $y = \frac{6}{2x+1}$  at the point  $(1, 2)$ .