

ASSIGNMENT 02
Fixed Closing Date: 06 May 2022
Total Marks: 100

1. Use the first principles of differentiation to determine $f'(x)$ for the following functions:

(a) $f(x) = 3x^2 - 4x + 1$ (5)

(b) $f(x) = \frac{2x+1}{x+3}$ (5)

(c) $f(x) = \frac{4}{\sqrt{1-x}}$ (5)

2. By using the first principles of differentiation, find the following:

(a) $f(x) = \frac{1-x}{2+x}$ (3)

(b) $f'(-3)$ (2)

3. Use appropriate differentiation techniques to determine the first derivatives of the following functions (simply your answers as far as possible).

(a) $f(v) = \frac{3\sqrt{v} - 2ve^v}{v}$ (5)

(b) $c_0(t) = (\sqrt{5})t + \frac{\sqrt{7}}{t}$ (5)

(c) $f(x) = \frac{x^2+1}{x^3-1}$ (5)

(d) $f(x) = \cos\sqrt{\sin(\tan \pi x)}$ (5)

(e) $f(x) = \frac{(\tan x) - 1}{\sec x}$ (5)

(f) $y = \frac{\cos x}{1 + \sin x}$ (5)

4. Determine the derivatives of the following functions:

$$(a) f(x) = \ln(x + \ln x) \quad (5)$$

$$(b) g(x) = \sqrt{\frac{x-1}{x^4+1}} \quad (5)$$

$$(c) h(x) = \sqrt{x} e^{x^2-x} (x+1)^{\frac{2}{3}} \quad (5)$$

$$(d) y(x) = (\sin x) \ln x \quad (5)$$

$$(e) y = (\sqrt{x})^{\sin x} \quad (5)$$

5. Determine the derivatives of the following inverse trigonometric functions:

$$(a) f(x) = \tan^{-1} \sqrt{x} \quad (5)$$

$$(b) y(x) = \ln \left(\frac{x^2 \cot^{-1} x}{\sqrt{x-1}} \right) \quad (5)$$

$$(c) g(x) = \sin^{-1}(3x) + \cos^{-1} \left(\frac{x}{2} \right) \quad (5)$$

$$(d) h(x) = \tan^{-1} \left(x - \sqrt{x^2+1} \right) \quad (5)$$

$$(e) k(x) = \left(\sqrt{7x^3 - 5x^2 + x} \right) \cot^{-1}(3 - 5x^2) - 9 \operatorname{cosec}^{-1}(2 - 3x^2) \quad (5)$$

Total: [100]