Gandaki University

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Bachelor of Information Technology

BSM 101

Exercise 2

Derivative

1. Find the dervatives of the following functon by definition approach:

   (a) $f(x) = \sqrt{x}$ (b) $f(x) = x^2$

2. Find $\frac{dy}{dx}$ of the following functions.

   a) $y = 5x^7 - 3\sqrt{x} + 1$ b) $y = \frac{5}{x^2} + x^{3/2} + \frac{1}{2\sqrt{x}} + \frac{x^4}{4} + 8x + \frac{x+3}{7}$ c) y=$\left(x^2 + 5\right)(2 - 7x)$

   d) $y = \frac{2x^2 - 3}{5x^2 + 4}$ e) $y = \left(3x^2 + 5\right)^{2/3}$ f) $y = (2x + 4)^{3/2}(5 - 3x)$ g) $y = \frac{x}{\sqrt{x^2+1}}$

3. Find $\frac{dy}{dx}$ from the following

   a) $y = \left(u^2 + 5\right)^2$ and $u = x^2 + 3$
   b) $y = z^3 + 2z + 1$ and $z = x^2 + 2$
   c) $y = \frac{t-2}{3t}$ and $t = \sqrt{x+1}$
   d) $y = \sqrt{x^2+1}$ and $x = \sqrt{t^2+1}$
   e) $y = \ln(5u - 3)$ and $u = 4x^3 - 3x^2$
   f) $x(t) = t^2 - 3,\ y(t) = 2t - 1,$
   g) $x(t) = 2t + 1,\ y(t) = t^3 - 3t + 4$
   h) $x(t) = 5\cos t,\ y(t) = 5\sin t,$

4. By implicit differentiation find $\frac{dy}{dx}$

   (a) $y^2 - 12x^3 = 8y$
   (b) $y^7 + x^{10} = y^{-2} - 6x^3 + 2$
   (c) $y^{-3} + 4x^{-1} = 8y^{-1}$
   (d) $y^2\left(4 - x^2\right) = y^7 + 9x$
   (e) $x^3 + x^2y + xy^2 + y^2$
   (f) $8xy + 2x^4y^{-3} = x^3$
   (g) $\frac{x}{y^3} = 1$

5. Differentiate

   (a) $y = z^5 - \mathbf{e}^z \ln(z)$.

(b) $y = ln(\cos x)$

(c) $y = e^{x^4}$

(d) $y = e^x ln(x)$

(e) $f(t) = \dfrac{1 + 5t}{\ln(t)}$

(f) $h(t) = 6^t - 4\mathbf{e}^t$

(g) $f(t) = \left(t^2 - 6t + 3\right)\mathbf{e}^t$