Ajibola Arafat Olayemi
19/MHS11/1023
Pharmacy
MAT 164

1. $y = \frac{1}{x-2}$

The function is defined for all real numbers except $x = 2$
Domain = Real numbers except $x = 2$
Co domain = Real numbers except $y = 0$

2. If $K = \ln V$

$$\frac{dK}{dV} = \frac{d(\ln V)}{dV} = \frac{1}{V}$$

3) $2x - 3y - 2 = 0$

$3y = 2x - 2$

$y = \frac{2x-2}{3}$

(i) $x^2 + y^2 = 4$

$x^2 + y^2 = 4$

$x^2/4 = y^2$

$y^2 = 4 - x^2$

$y = \pm\sqrt{x^2 - 4}$

$y = \sqrt{4 - x^2}$

4. $\rho = \sin^{-1} t$

$\rho = \frac{t}{\sin}$

$t = \sin\rho$

$\frac{dt}{d\rho} = \cos\rho$

$\frac{d\rho}{dt} = \frac{1}{\cos\rho}$

Recall $= \cos\rho = \sqrt{1 - x^2}$

$\frac{d\rho}{dt} = \frac{1}{\sqrt{1-x^2}}$

5. $f(x) = 2x^2 - 5$

$g(x) = 4x - 2$

$fog(x) = 2(4x-2)^2 - 5$

$2(16x^2 - 16x + 4) - 5$

$32x^2 - 32x + 8 - 5$

$fog(x) = 32x^2 - 32x + 3$

5. $gof(x) = 4(2x^2 - 5) - 2$

$8x^2 - 20 - 2$

$gof(x) = 8x^2 - 22$

6. If $f(x) = 3x^2 - 2x + 1 = 0$

$f_e(x) + f_o(x) = f(x)$

$f_e(x) = \frac{f(x) + f(-x)}{2}$

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

$3x^2 + 2x + 1$

$f_e(x) = \frac{3x^2 - 2x + 1 + 3x^2 + 2x + 1}{2} = \frac{6x^2 + 2}{2} = 3x^2 + 1$

$f_o(x) = \frac{f(x) - f(-x)}{2}$

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

$\frac{-4x}{2} = -2x$

$f_o(x) = -2x$

$f(x) = f_e(x) + f_o(x) = 3x^2 + 1 - 2x$

$3x^2 - 2x + 1$

8. Find $\frac{dy}{dx}$

$y = 3t^2$ $\quad x = 1/t^2$

$\frac{dy}{dt} = 6t$ $\quad \frac{dx}{dt} = -2t^{-3}$

$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx} = 6t \times -2t^3 = -12t^4 \quad \frac{6t}{-2t^{-3}}$

$\frac{dy}{dx} = \frac{6t}{\frac{-2}{t^3}} = 6t \times \frac{t^3}{-2} = -3t^4$

7. $y = \cos x$

$y + \delta y = \cos(x + \delta x)$

subtract y from both sides

$\delta y = \cos(x + \delta x) - y$

but $y = \cos x$

$\delta y = \cos(x + \delta x) - \cos x$

$\cos(A+B) - \cos(A-B) = -2\sin A \sin B$ ... 1

compare 1 and 2

$A + B = x + \delta x$

$A - B = x$

$A = \frac{x + \delta x}{2}$

$B = \frac{\delta x}{2}$

compare 1 and 2

$\cos(x + \delta x) - \cos x = -2\sin(x + \delta x/2)\sin(\delta x/2)$

$\Delta y = -2\sin\left(x + \frac{\delta x}{2}\right)\sin\left(\frac{\delta x}{2}\right)$

$\frac{\delta y}{\delta x} = \frac{-2\sin\left(x + \frac{\delta x}{2}\right)\sin\left(\frac{\delta x}{2}\right)}{\delta x}$

$\frac{\delta y}{\delta x} = -\sin\left(x + \frac{\delta x}{2}\right)\frac{\sin\left(\frac{\delta x}{2}\right)}{\frac{\delta x}{2}}$

$\lim_{\delta x \to 0} \frac{\sin(\delta x/2)}{(\delta x/2)} = 1$

$\lim_{\delta x \to 0} \frac{\delta y}{\delta x} = \lim_{\Delta x \to 0} -\sin\left(x + \frac{\delta x}{2}\right) \cdot 1$

$-\sin(x+0)$

$-\sin x.$

9. $y = x^2 \cos 2x e^{4x}$

$\frac{d}{dx}(\ln y) = \frac{d}{dx}(\ln x^2) + \frac{d}{dx}(\cos 2x) + \frac{d}{dx}(e^{4x})$

$\frac{1}{y} \cdot \frac{dy}{dx} = \frac{1}{x^2}(2x) + \frac{1}{\cos 2x}(-2\sin 2x) + \frac{1}{e^{4x}}(4e^{4x})$

$\frac{1}{y} \cdot \frac{dy}{dx} = \frac{2}{x} - \frac{2\sin 2x}{\cos 2x} + 4$

$\frac{1}{y} \cdot \frac{dy}{dx} = \frac{2}{x} - 2\tan 2x + 4$

$\frac{dy}{dx} = y\left(\frac{2}{x} - 2\tan 2x + 4\right)$

$\frac{dy}{dx} = x^2 \cos 2x e^{4x}\left(\frac{2}{x} - 2\tan 2x + 4\right)$

10. $y = \sin(3x^3 + 5)$

let $u = 3x^3 + 5$

$\frac{du}{dx} = 9x^2$

$y = \sin u \quad \frac{dy}{du} = \cos u$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \cos u \times 9x^2$

$9x^2 \cos(3x^3 + 5)$.