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Pharmacy

MAT 109

1. $y = 1/x-2$
- The function is defined for all real numbers except $x = 2$
- The domain is the set of real numbers except $x = 2$
- The codomain of the set of real number except $y = 0$

2. $k = \ln v$

$\frac{dk}{dv} = \frac{1}{v}$

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

$-3y = 2 - 2x$

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

$y = \frac{2x + 2}{3} ; \frac{2}{3}(x+1)$

b $x^2 + y^2 = 4$

$y^2 = 4 - x^2$

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

4 Find dP/dt, $P = \sin^{-1} t$

$P = \frac{t}{\sin}$; $t = \sin P$ → Recall

$dt/dP = \cos P$; $dP/dt = 1/\cos P$

Recall, $\cos^2 y + \sin^2 y = 1$

$\cos y = \pm\sqrt{1 + \sin^2 y}$

$t = \sin P$

$\therefore \cos P = \sqrt{1 - t^2}$

Hence, $dP/dt = 1/(1-t^2)$

5 $F(x) = 2x^2 - 5$, $g(x) = 4x - 2$

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

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

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

$= 32x^2 - 32x + 3$

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

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

6) Show that $f(x) = fe(x) + fo(x)$

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

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

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

$= 3x^2 + 2x + 1$

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

$= \frac{6x^2 + 2}{2} = 3x^2 + 1$

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

$= -4x/2 = -2x$

$F_e(x) + F_o(x) = 3x^2 + 1 - 2x$

$= 3x^2 - 2x + 1$

7) Differentiate $y = \cos x$

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

$\delta y = \cos(x + \delta x) - \cos x$ [$y = \cos x$) (1)

Recall

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

Comparing (A) & (B)

$A + B = x + \delta x$ (3)

$A - B = x$ (4)

Adding (3) & (4) and subtracting (3) & (4)

$2A = 2x + \delta x$ & $B = \delta x/2$

$A = \frac{2x + \delta x}{2}$, Comparing (1) & (3)

$\delta y = \cos - \cos x$

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

Dividing through by δx

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

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

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

Taking limit $\delta x \to 0$

$\frac{\sin \delta x/2}{\delta x/2} = 1$

$\delta y/\delta x = -\sin(x + 0/2) \times 1$
$\delta x \to 0$

$\delta y/\delta x = -\sin x$

8 $y = 3t^2; \ x = 1/t^2$

$dy/dx = dy/dt \times dt/dx$

$= dy/dt \div dx/dt$

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

$dy/dx = 6t \div -2/t^3$

$= 6t \times -2/t^3 = \frac{-6x-2}{t^2}$

$= 12/t^2$

$dy/dx = -12/t^2$

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

Soln

Taking Loge of both sides

$\ln y = \ln x^2 + \ln \cos 2x + \ln e^{4x}$

Differentiating both w.r.t x

$1/y \ dy/dx = 1/x^2(2x) + 1/\cos 2x(-2\sin 2x) + 4$

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

Multiplying both sides by y

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

$= x^2 \cos 2x \ e^{4x} \times 2/x - \frac{2\sin 2x}{\cos x} + 4$

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

Let $u = 3x^3 + 5$

$\frac{dy}{du} = \cos x$

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

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{dy}{dx}$

$= \cos u \times 9x^2$

$= 9x^2 \cos u$

$= 9x^2 \cos 3x^3 + 5$

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