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Dept: PHARMACY

Course Title: GENERAL MATHEMATICS

Course Code: MAT 104

Mat No: 19/MHS11/094

Assignment

1) For what values of x is the function $y = \frac{1}{(x-2)}$ defined? State the domain and co-domain

Soln

$1/(x-2) = \frac{1}{2-2} = \frac{1}{0} = \text{Undefined}$

The function is defined for all real numbers except $x = 2$

Domain = All real numbers except 2

co-domain = All real numbers except $y = 0$

2. If $K = \ln v$, differentiate K

Soln

$\frac{d}{dk} f(\ln v) = \frac{1}{v}$

$\therefore d/dk = 1/v$

3. Express y as an explicit function of x in the following:

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

Soln

$2x - 2 = 3y$

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

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

$y^2 = 4 - x^2$

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

4. If $P = \sin^{-1} t$, find the derivative of P.

Soln

$P = \sin^{-1} t$

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

$t = \sin P$

Differentiating both sides with respect to t

$dt/dp = \cos P$

but we want dP/dt therefore

$dP/dt = \frac{1}{\cos P}$

Recall

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

which could be re-written as

$\cos^2 P + \sin^2 P = 1$

$\cos^2 P = 1 - \sin^2 P$

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

but $\sin P = t \Rightarrow \sin^2 P = t^2$

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

hence

$dP/dt = 1/\cos P$

$= \frac{1}{\sqrt{1 - t^2}}$

5. If $f(x) = 2x^2 - 5$ and $g(x) = 4x - 2$, find $fog(x)$ an
$gof(x)$.

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fog

fog (x)

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

$= (fog)x = f(g(x))$

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

$g(x) = 4x - 2$

$\therefore f(g(x)) = f(4x - 2]$

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

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

$= 2[16x^2 - 8x - 8x + 4) - 5$

$= 32x^2 - 16x + 3$

(

gof (x)

$g(x) = 4x - 2$

$(gof)x = g(f(x))$

$g(x) = 4x - 2$

$g[2x^2 - 5]$

$= 4[2x^2 - 5) - 2$

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

6. If $f(x) = 3x^2 - 2x + 1 = 0$, show that $fe(x) + fo(x) = f(x)$

soln

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

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

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

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

$\frac{6x^2 + 2}{2}$

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Factorize

$= \frac{\cancel{2}[3x^2+1]}{\cancel{2}}$

$= 3x^2+1$

$f_0 = \frac{f(x) - f(-x)}{2}$

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

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

$= -2x$

$\therefore f(x) = f_e(x) + f_0(x)$

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

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

7. Differentiate $y = \cos x$ from first Principle

Soln

$y = \cos x$

$dy/dx = -\sin x$

8. Find dy/dx if $y = 3t^2$ and $x = 1/t^2$

Soln

$y = 3t^2 : dy/dt = 6t$

$x = 1/t^2 ; dy/dt = -1/t^4$

$dy/dx = dy/dt \,/\, dx/dt = \frac{6t}{-1/t^4} = 6t \times -t^4$

$= -6t^5$

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9. Find dy/dx if $y = x^2 \cos 2x\, e^{4x}$

Soln

Taking Loge of both sides

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

Differentiating both sides in respect to x

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

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

multiplying both sides by y

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

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

10 Given that $y = \sin(3x^3 + 5]$, find the derivative of y

Soln

Let $u = 3x^3 + 5$

$dy/dx = 9x^2$

$y = \sin u$; $dy/du = \cos u$

$\therefore dy/du \times du/dx$

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

$= 9x^2 \cos u$

but $u = 3x^3 + 5$

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