Abdulsalam Onipoyi Joan
19/MHS11/002
Pharmacy
MAT 104
Assignment

1) For what values of x is function $y = 1/(x-2)$ defined? State the domain and domain

$y = 1/x - 2$

Function is defined for all real numbers except $x = 2$

domain: all real numbers of x except 2

codomain: all real numbers of y

2) If $k = \ln v$, differentiate k

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

3) Express y and an explicit function of in x in the following

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

$2 - 3\,dy/dx = 0$

$-3\,dy/dx = -2$

$dy/dx = \frac{-2}{-3}$

$= 2/3$

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

$2x + 2y\,dy/dx = 0$

$dy/dx = \frac{-2x}{2y}$

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

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

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

$u = t$

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

$\arcsin x = \frac{1}{\sqrt{1-x^2}}$

$\frac{dP}{du} = \frac{1}{\sqrt{1-u^2}}$

$dP/dt = dP/du \times du/dt$

$= \frac{1}{\sqrt{1-u^2}} \cdot 1$

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

b) $x^2 + y^2$

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

~~$f(x)\ 3x^2$~~ -

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

$g(x) = 4x - 2$

$fog(x)$ $gof(x)$

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

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

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

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

$32x^2 - 32x + 3$

$gof(x) = 4f - 2$

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

$8x^2 - 20 - 2$

$8x^2 - 22$

6) If $f(x) = 3x^2 - 2x + 1 = 0$, show that $f_e(x) + f_o(x) = f(x)$

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

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

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

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

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

$f(e) = \frac{6x^2 + 2}{2}$ $f(e) = 3x^2 + 1$

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

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

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

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

$\therefore f(e) + f(o) = f(x)$

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

7) Differentiate $y = \cos x$ from first principle

$y = \cos x$

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

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

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

Let $A = \cos(x + \Delta x)$

$B = \cos x$

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

$\Delta y = -2\sin\frac{\Delta x}{2} \sin\frac{2x + \Delta x}{2}$

$\Delta y = \frac{1}{2}x - 2\sin\Delta x \sin\frac{2x + \Delta x}{2}$

$\frac{1}{2} \times 2$

$\Delta y = \sin\Delta x \sin\frac{2x + \Delta x}{2}$

$\Delta y = -\sin x$

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

$\frac{dy}{dt} = 6t$

$\frac{dx}{dt} = \frac{1}{-2t^3}$

$6t \div \frac{1}{-2t^3}$

$6t \times -2t^3$

$= -12t^4$

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

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

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

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

$\frac{dy}{dx} = \frac{2x}{x^2} - \frac{\sin 2x}{\cos 2x} + 1$

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

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

find the derivative of y

Let $u = 3x^3 + 5$

$du/dx = 9x^2$

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

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

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

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