Date:........................ Q 1

1 (a) $y = \dfrac{3x^3 - 5x^2 + 5}{x^2+1}$

$$\frac{dy}{dx} = \frac{(x^2+1)\frac{d}{dx}(3x^3-5x^2+5) - (3x^3-5x^2+5)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}$$

$$= \frac{(x^2+1)(9x^2-10x+0) - (3x^3-5x^2+5)(2x)}{(x^2+1)^2}$$

$$= \frac{9x^4 - 10x^3 + 9x^2 - 10x - 6x^4 + 5x^3 - 10x}{(x^2+1)^2}$$

$$\frac{dy}{dx} = \frac{3x^4 - 5x^3 + 9x^2 - 20x}{(x^2+1)^2}$$

Ans

Date:........................ Q(1)(b)

Q1 (b) $y = \dfrac{(x^2+1)^2}{(x^2-1)}$

$$\frac{dy}{dx} = \frac{(x^2-1)\frac{d}{dx}(x^2+1)^2 - (x^2+1)^2\left(\frac{d}{dx}(x^2-1)\right)}{(x^2-1)^2}$$

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

$$= \frac{(x^2-1)(4x^3+4x) - (x^4+1+2x^2)(2x)}{(x^2-1)^2}$$

$$= \frac{4x^5 + \cancel{4x^3} - \cancel{4x^3} - 4x - 2x^5 - 2x - 4x^3}{(x^2-1)^2}$$

$$\frac{dy}{dx} = \frac{2x^5 - 4x^3 - 6x}{(x^2-1)^2}$$

Azam Paper Products
Urdu Bazar Lahore.

Date:

(Q2)(b)

So (A) becomes by putting values from (**) & (***) we get

$$\frac{dy}{dx} = 1\cdot\left(\frac{2}{3}x^{-1/3} + \frac{52}{3}x^{7/6} + 7x^{1/6} + 10x^{2/3}\right)$$

$$\Rightarrow \frac{dy}{dx} = \boxed{\frac{2}{3}x^{-1/3} + \frac{52}{3}x^{7/6} + 7x^{1/6} + 10x^{2/3}}$$

(b) $y = \left(\frac{1-x}{1+x}\right)^{1/2}$

let $u = \frac{1-x}{1+x}$ then

$y = u^{1/2}$ — (*)

Also $u = \frac{1-x}{1+x}$

$$\frac{du}{dx} = \frac{(1+x)\frac{d}{dx}(1-x) - (1-x)\frac{d}{dx}(1+x)}{(1+x)^2}$$

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

Date: ....

Q2 (a)

Q^2: $y = (1+2\sqrt{x})^3 x^{2/3}$ $\quad \because (a+b)^3 = a^3+b^3+3a^2b+3ab^2$

(a) $y = (1+2\sqrt{x})^3 x^{2/3}$

$y = \left((1)^3+(2\sqrt{x})^3+3(1)^2(2\sqrt{x})+3(1)(2\sqrt{x})^2\right)x^{2/3}$

$y = (1+8x^{3/2}+6x^{1/2}+6x)x^{2/3}$ $\quad \frac{3}{2}+\frac{2}{3} = \frac{9+4}{6}$

$y = x^{2/3}+8x^{13/6}+6x^{7/6}+6x^{5/3}$ — (x) $\quad \frac{1}{2}+\frac{2}{3} = \frac{3+4}{6}$

let $u = x^{2/3}+8x^{13/6}+6x^{7/6}+6x^{5/3}$ $\quad \frac{2}{3}-1 \quad 1+\frac{2}{3} = \frac{3+2}{3}$

Then $\frac{du}{dx} = \frac{2}{3}x^{-1/3}+8(13/6)x^{13/6-1}+6(7/6)x^{7/6-1}+6(5/3)x^{5/3-1}$ $\quad 13-6$

$\frac{du}{dx} = \frac{2}{3}x^{-1/3}+\frac{52}{3}x^{7/6}+7x^{1/6}+10x^{2/3}$ — (xx)

Now (x) becomes ~~dy~~

$y = u \Rightarrow \frac{dy}{du} = 1$ — (xxx)

& using chain rule of Differentiation

$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$ — (A)

Date:....................... Q 2(b)

$$\frac{du}{dx} = \frac{-1-x-1+x}{(1+x)^2} = -2/(1+x)^2$$

$$\frac{du}{dx} = -2/(1+x)^2 \quad — (A)$$

Also $\frac{dy}{du} = \frac{1}{2}u^{1/2-1} = \frac{1}{2}u^{-1/2} \quad — (B)$

Now Diff (B) w.r.t x using chain rule. we get

$$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$$ putting values from (A) & (B)

$$= \frac{1}{2}u^{-1/2}\left(-2/(1+x)^2\right)$$

$$= \frac{1}{\cancel{2}u^{1/2}}\left(-\cancel{2}/(1+x)^2\right)$$

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

$$= \boxed{\frac{-1}{\left(\frac{(1-x)}{(1+x)}\right)^{1/2}(1+x)^2}}$$

Azam Paper Products
URDU BAZAR LAHORE.

Date:........................ Q3 (a) (b)

Q3: (a) $\int \frac{1}{\sqrt{x^3}} dx$

Sol $\int \frac{1}{x^{3/2}} dx$

$\int x^{-3/2} dx$

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

$= \frac{x^{-1/2}}{-1/2} + c$

$= \boxed{\frac{-2}{\sqrt{x}} + c}$

(b) $\int \frac{1}{(6x+7)^6} dx$

$= \frac{1}{6}\int (6x+7)^{-6} dx$ $\qquad = 2 \times \frac{1}{2} \; 6$

$= \frac{1}{6} \frac{(6x+7)^{-6+1}}{(-6+1)} + c$

$= -\frac{1}{30}(6x+7)^{-5} + c$

Date:........................

Q3 (b)

$= \frac{-1}{30(6x+7)^5} + c$