Date: ___/___/___

Q3

Ans 3(b) $\int \frac{1}{(6x+7)^6} dx$

$= \int (6x+7)^{-6} dx$

using again above mention

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

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

$\int \frac{1}{(6x+7)} dx = \frac{1}{30} (6x+7)^5 + C$

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2020.04.26 17:51

Q3

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

$= \int \frac{1}{(x^3)^{1/2}} dx$

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

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

using formula $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

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

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

$\int \frac{1}{\sqrt{x^3}} dx = -\frac{2}{\sqrt{x}} + C$

Date __/__/__

$$\Rightarrow \frac{dy}{dx} = \frac{1}{2\sqrt{u}} \times \frac{(-2)}{(1+x)^2}$$

$$\text{use } u = \frac{1-x}{1+x}$$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{2}\sqrt{\frac{1+x}{1-x}} \times \frac{(-2)}{(1+x)^2}$$

$$\boxed{\frac{dy}{dx} = \frac{-1}{\sqrt{1-x}} (1+x)^{3/2}}$$

Q2

Ans 2(b) $y = \sqrt{\frac{1-x}{1+x}}$

Let $u = \frac{1-x}{1+x}$ ——— (1)

$y = \sqrt{u}$

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

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

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

2) => $\frac{dy}{du} = \frac{1}{2\sqrt{u}}$

using chain rule

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

Q2

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

Let $x = u$

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

$\frac{dy}{du} = (1+2\sqrt{u})^3 \frac{2}{3} u^{2/3-1} + u^{2/3} \, 3(1+2\sqrt{u})^2 \times \frac{1}{\sqrt{u}}$

$\frac{dy}{dx} = (1+2\sqrt{u})^3 \frac{2}{3} u^{-1/3} + 3u^{1/6}(1+2\sqrt{u})^2$

$\frac{dx}{du} = 1$

using chain rule

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

$= (1+2\sqrt{u})^2 \left[(1+2\sqrt{u}) \frac{2}{3} u^{-1/3} + 3u^{1/6}\right] \times (1)$

$\Rightarrow \frac{dy}{dx} = (1+2\sqrt{u})^2 \left\{\frac{2}{3}(1+2\sqrt{u}) u^{-1/3} + 3u^{1/6}\right\}$

use $u = x$

$\Rightarrow \frac{dy}{dx} = (1+2\sqrt{x})^2 \left\{\frac{2}{3}(1+2\sqrt{x}) x^{-1/3} + 3x^{1/6}\right\}$

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

Use Quotient rule

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

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

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

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

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

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Q1 $\frac{2x^3-3x^2+5}{x^2+1}$

Ans 1(a) $\frac{d}{dx}\left(\frac{2x^3-3x^2+5}{x^2+1}\right)$

Using Quotient rule.

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

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

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

$$\frac{2x\left[3x(x^2+1)(x-1)-2x^3-3x^2+5\right]}{(x^2+1)^2}$$

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2020.04.26 17:50