

Indefinite Integrals Ex 19.16 Q1

Let 
$$I = \int \frac{\sec^2 x}{1 - \tan^2 x} dx$$
  
Let  $\tan x = t$   

$$\Rightarrow \sec^2 x \ dx = dt$$

$$I = \int \frac{dt}{(1)^2 - t^2}$$

$$= \frac{1}{2(1)} \log \left| \frac{1+t}{1-t} \right| + C \qquad \left[ \text{Since, } \int \frac{1}{a^2 - x^2} dx = \frac{1}{2a} \log \left| \frac{a+x}{a-x} \right| + C \right]$$

$$I = \frac{1}{2} \log \left| \frac{1 + \tan x}{1 - \tan x} \right| + C$$

Indefinite Integrals Ex 19.16 Q2

Indefinite Integrals Ex 19.16 Q3

Let 
$$I = \int \frac{\cos x}{\sin^2 x + 4\sin x + 5} dx$$
  
Let  $\sin x = t$   

$$\Rightarrow \cos x dx = dt$$
so,  $I = \int \frac{dx}{t^2 + 4t + 5}$ 

$$= \int \frac{dt}{t^2 + 2t(2) + (2)^2 - (2)^2 + 5}$$

$$= \int \frac{dt}{(t+2)^2 + 1}$$

Again, Let 
$$(t+2) = u$$
  

$$dt = du$$

$$I = \int \frac{dt}{u^2 + 1}$$

$$= \tan^{-1}(u) + c \qquad \left[ \text{Since, } \int \frac{1}{x^2 + 1} dx = \tan^{-1} x + c \right]$$

$$I = \tan^{-1}(t+2) + c$$

$$I = \tan^{-1}(\sin x + 2) + c$$

Indefinite Integrals Ex 19.16 Q4

Let 
$$I = \int \frac{e^x}{e^{2x} + 5e^x + 6} dx$$
  
Let  $e^x = t$   
 $\Rightarrow e^x dx = dt$   
so,  $I = \int \frac{dt}{t^2 + 5t + 6}$   
 $= \int \frac{dt}{t^2 + 2t \left(\frac{5}{2}\right) + \left(\frac{5}{2}\right)^2 - \left(\frac{5}{2}\right)^2 + 6}$   
 $= \int \frac{dt}{\left(t + \frac{5}{2}\right)^2 - \frac{1}{4}}$ 

Put 
$$\left(t+\frac{5}{2}\right) = u$$
  

$$\Rightarrow dt = du$$

$$I = \int \frac{dt}{u^2 - \left(\frac{1}{2}\right)^2}$$

$$= \frac{1}{2\left(\frac{1}{2}\right)} \log \left| \frac{u - \frac{1}{2}}{u + \frac{1}{2}} \right| + c \qquad \left[ \text{Since, } \int \frac{1}{x^2 - a^2} dx = \frac{1}{2a} \left| \frac{x - a}{x + a} \right| + c \right]$$

$$I = \log \left| \frac{2u - 1}{2u + 1} \right| + c$$

$$I = \log \left| \frac{2\left(t + \frac{5}{2}\right) - 1}{2\left(t + \frac{5}{2}\right) + 1} \right| + c$$

$$I = \log \left| \frac{e^x + 2}{e^x + 3} \right| + c$$

Indefinite Integrals Ex 19.16 Q5

Let 
$$I = \int \frac{e^{3x}}{4e^{6x} - 9} dx$$
  
Let  $e^{3x} = t$   
 $\Rightarrow 3e^{3x} dx = dt$   
 $\Rightarrow e^{3x} dx = \frac{dt}{3}$   
 $I = \frac{1}{3} \int \frac{dt}{4t^2 - 9}$   
 $= \frac{1}{12} \int \frac{dt}{t^2 - \left(\frac{3}{2}\right)^2}$   
 $= \frac{1}{12} \times \frac{1}{2\left(\frac{3}{2}\right)} \log \left| \frac{t - \frac{3}{2}}{t + \frac{3}{2}} \right| + c$   $\left[ \text{Since, } \int \frac{1}{x^2 - a^2} dx = \frac{1}{2a} \left| \frac{x - a}{x + a} \right| + c \right]$   
 $I = \frac{1}{36} \log \left| \frac{2t - 3}{2t + 3} \right| + c$ 

$$I = \frac{1}{36} \log \left| \frac{2e^{3x} - 3}{2e^{3x} + 3} \right| + c$$

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