


1.

Assignment 1

$$\int (8x^6 + 5x^4 + 7\csc^2(5x)) dx =$$

\downarrow \downarrow
 $\frac{8x^7}{7} + x^5 +$

$$7\csc^2(5x)$$

$$\text{let } u = 5x$$

$$du = 5 dx$$

$$dx = \frac{du}{5}$$

$$\int 7 \cdot \csc^2(5x) = 7 \int \csc^2(u) \frac{du}{5} =$$

$$\frac{7}{5} \left(-\cot(u) du \right) = \boxed{-\frac{7}{5} \cot(5x) + C}$$

$$\frac{8x^7}{7} + x^5 - \frac{7}{5} \cot(5x) + C$$

$$2. \int \left(\frac{1}{8\sqrt{x}} - 6 \tan^2 x \right) dx =$$

$$\int \frac{1}{8\sqrt{x}} dx = \int x^{-\frac{1}{8}} = \frac{8}{7} \cdot x^{\frac{7}{8}} + C$$

$$\begin{aligned} \int 6 \cdot \tan^2 x dx &= 6 \int \tan^2 x dx = \\ 6 \int \tan x \cdot \tan x dx &= 6 \int \tan x \cdot (\sec^2 x)' dx \end{aligned}$$

$$= \tan x \cdot \sec^2 x - \int (\sec^2 x)' \tan x dx =$$

$$= \int 6(\sec^2 x - 1) dx = 6 \int \sec^2 x dx$$

$$- 6 \int dx = 6 \tan x - 6x + C$$

Ans: $\boxed{\frac{8}{7} \cdot x^{\frac{7}{8}} - 6 \tan x + 6x + C}$

3.

$$\int e^{45x} \cdot \sin(20x) dx = \int e^{45x} \cdot \sin(20x)$$

$$= e^{45x} \cdot \sin(20x) - \int (-\cos(20x))' \cdot e^{45x} dx =$$

$$e^{45x} \cdot \sin(20x) - e^{45x} \int (-\cos(20x))'$$

let $u = 20x$

$$du = 20 dx$$

$$dx = \frac{du}{20}$$

$$\int (-\cos(u)) \frac{du}{20} = \frac{1}{20} (-\cos(20x))$$

$$e^{45x} \cdot \cos(20x)$$

4

$$\int \cos^{-1}(12x) = \int 1 \cdot \cos^{-1}(12x) =$$

$$\int (x)' \cdot \cos^{-1}(12x) dx = x \cdot \cos^{-1}(12x) -$$

$$\int \cos^{-1}(12x)$$

$$\text{let } u = 12x$$

$$du = 12 dx$$

$$dx = \frac{du}{12}$$

$$\frac{1}{12} \int \cos^{-1}(u) du = -\frac{1}{\sqrt{1-u^2}}$$

5

$$\int x^2 e^{49x} = \frac{e^{49x} \cdot x^2}{49} - 2 \int x \cdot e^{49x} dx =$$

$$= \frac{e^{45x} \cdot x^2}{45} - 2 \int x \cdot e^{49x} dx =$$

$$= \frac{e^{45x} \cdot x^2}{45} - 2 \left(x \cdot e^{49x} \right) =$$

$$= \frac{e^{45x} \cdot x^2}{45} - \frac{2x \cdot e^{49x}}{49}$$