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DEPT/COL: MECHATRONICS ENGINEERING

MATRIC NO: 19/ENG05/010

COURSE CODE: MAT104 DR.OYELAMI'S GROUP

## ANSWERS

### QUESTION ONE

$$\int \sin 7x \cos 2x dx$$

Recall

$$\sin A \cos B = \frac{1}{2}(\sin(A+B) + \sin(A-B))$$

$$\int \sin 7x \cos 2x = \frac{1}{2} \int (\sin(7x+2x) + \sin(7x-2x)) dx$$

$$\int \sin 7x \cos 2x = \frac{1}{2} \int (\sin(9x) + \sin(5x)) dx$$

$$\int \sin 7x \cos 2x = \frac{1}{2} \int (\sin 9x) dx + \frac{1}{2} \int (\sin 5x) dx$$

$$\int \sin 7x \cos 2x = -\frac{1}{18} \cos 9x - \frac{1}{10} \cos 5x + c$$

### QUESTION TWO

$$\int \cos 3x \cos x dx$$

Recall

$$\cos A \cos B = \frac{1}{2}(\cos(A-B) + \cos(A+B))$$

$$\int \cos 3x \cos x dx = \frac{1}{2} \int (\cos(3x-x) + \cos(3x+x)) dx$$

$$\int \cos 3x \cos x dx = \frac{1}{2} \int (\cos(2x) + \cos(4x)) dx$$

$$\int \cos 3x \cos x dx = \frac{1}{2} \int (\cos 2x) dx + \frac{1}{2} \int (\cos 4x) dx$$

$$\int \cos 3x \cos x dx = \frac{1}{4} \sin 2x + \frac{1}{8} \sin 4x + c$$

### QUESTION THREE

$$\int \frac{\cos x}{\sin^2 x} dx$$

$$\int \frac{\cos x}{\sin^2 x} dx = \int \frac{\cos x}{(\sin x)(\sin x)} dx$$

$$\int \frac{\cos x}{\sin^2 x} dx = \int \frac{\cos x}{\sin x} \cdot \frac{1}{\sin x} dx$$

$$\int \frac{\cos x}{\sin^2 x} dx = \int \cot x \cdot \csc x dx$$

$$\int \frac{\cos x}{\sin^2 x} dx = -\csc x + c$$

### QUESTION FOUR

$$\int_1^2 \int_0^3 9x^2 y dx dy$$

$$\int_1^2 \int_0^3 9x^2 y dx dy =$$

$$\text{Firstly } \int_0^3 9x^2 y dx = [3x^2]^3 - 0$$

$$= 81y$$

Sub 81y into the original integral

$$\int_1^2 81y dy = \left[ \frac{81y^2}{2} \right]_1^2$$

$$\int_1^2 81y dy = \frac{81(2)}{2} - \frac{81(1)}{2}$$

$$\int_1^2 81y dy = 162 - 40.5$$

$$\int_1^2 81y dy = 121.5$$