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MA 226 Quiz 1 - A

Please show your work.

1. Use the method of partial fractions to integrate

$$\int \frac{x+12}{(x-3)(x+2)} dx$$

$$\frac{x+12}{(x-3)(x+2)} = \frac{A}{x-3} + \frac{B}{x+2}$$

$$= \frac{A(x+2) + B(x-3)}{(x-3)(x+2)}$$

$$= \frac{(A+B)x + 2A - 3B}{(x-3)(x+2)}$$

$$\begin{aligned} A+B &= 1 \\ 2A-3B &= 12 \end{aligned} \Rightarrow \begin{aligned} 2A+2B &= 2 \\ -(2A-3B) &= -12 \end{aligned}$$

$$5B = -10$$

$$B = -2$$

$$A = 3$$

$$\frac{x+12}{(x-3)(x+2)} = \frac{3}{x-3} - \frac{2}{x+2}$$

$$\int \frac{x+12}{(x-3)(x+2)} dx =$$

$$\int \frac{3}{x-3} - \frac{2}{x+2} dx$$

$$3 \ln|x-3| - 2 \ln|x+2| + C$$

2. Use the method of integration by parts to integrate $\int_{x=0}^{\pi} x \cdot \sin(x) dx =$

$$\begin{aligned} \int_{x=0}^{\pi} \underbrace{x \cdot \sin x}_{u \cdot dv} dx &= -x \cdot \cos x \Big|_0^{\pi} - \int_0^{\pi} -\cos x dx = (-\pi(-1) - 0) + \sin x \Big|_0^{\pi} \\ &= \pi - 0 + (0 - 0) \\ &= \boxed{\pi} \end{aligned}$$

$du = dx \quad v = -\cos x$