

Math 152 Quiz #3 Answers

1. (a) Letting $u = \frac{1}{t^2} \Rightarrow du = -2t^{-3} dt$ or $-\frac{1}{2} du = \frac{1}{t^3} dt$

$$\begin{aligned}\text{So, } \int \frac{4 \cos(1/t^2)}{t^3} dt &= -2 \int \cos u du = -2 \sin u + C \\ &= \boxed{-2 \sin(1/t^2) + C}\end{aligned}$$

(b) Letting $u = x - 1 \Rightarrow du = dx$

$$\begin{aligned}\text{So, } \int_1^2 x \cdot (x - 1)^8 dx &= \int (u + 1) \cdot u^8 du \quad (\text{since } x = u + 1) \\ &= \int (u^9 + u^8) du \\ &= \frac{1}{10}u^{10} + \frac{1}{9}u^9 \\ &= \frac{1}{10}(x - 1)^{10} + \frac{1}{9}(x - 1)^9 \Big|_1^2 \\ &= \frac{1}{10}(1)^{10} + \frac{1}{9}(1)^9 - 0 \\ &= \boxed{\frac{19}{90}}\end{aligned}$$

(Note: If you choose to change the bounds to u -values (and never have to return to the original variable x , then your upper bound would be $u = 1$ and your lower bound will be $u = 0$.)

2. Area = $\int_{-\pi/2}^{3\pi/2} \sin x - (-1) dx = \int_{-\pi/2}^{3\pi/2} \sin x + 1 dx$

$$\begin{aligned}&= -\cos x + x \Big|_{-\pi/2}^{3\pi/2} \\ &= -\cos\left(\frac{3\pi}{2}\right) + \frac{3\pi}{2} - \left(-\cos\left(-\frac{\pi}{2}\right) + \frac{-\pi}{2}\right) \\ &= \boxed{2\pi}\end{aligned}$$