

Math 114 Quiz Solutions - Week 10

Please write neatly. You must show your work to receive credit. Draw a box around your final answer.

1. The velocity of an object is $v(t) = \frac{t}{t^2 + 1}$ at time t . Find the average velocity from $t = 1$ to $t = 7$.

Sol. Average velocity

$$v_{avg} = \frac{1}{7-1} \int_1^7 \frac{t dt}{t^2 + 1}$$

By u-substitution $u = t^2 + 1$ we have $t dt = \frac{du}{2}$. Thus,

$$v_{avg} = \frac{1}{7-1} \int_2^{50} \frac{du}{2u} = \frac{1}{12} \ln u \Big|_2^{50} = \frac{1}{12} (\ln 50 - \ln 2) = \frac{1}{2} \ln \frac{50}{2} = \frac{1}{12} \ln 25 = \frac{1}{6} \ln 5$$

2. Find the volume of revolution of the line $y = x + 1$, $0 \leq x \leq 3$ about x -axis using the disk method

Sol. The volume, by disk method, is

$$\pi \int_0^3 (f(x))^2 dx = \pi \int_0^3 (x+1)^2 dx = \frac{\pi(x+1)^3}{3} \Big|_0^3 = \frac{64\pi}{3} - \frac{\pi}{3} = 21\pi$$