

MAT 106
Quiz #16
November 5, 2004

Name: Key

You may not use your notes. Please show all of your work. An answer without justification will receive little credit.

(1) Evaluate the following.

a.) $\int \left(\frac{\sin(x)}{1-\sin^2(x)} \right) dx = \int \frac{\sin(x)}{\cos^2(x)} dx = \int \tan(x) \sec(x) dx = \sec(x) + C$

b.) $\int (u^2 + 1 + \frac{1}{u^2}) du = \frac{1}{3}u^3 + u - \frac{1}{u} + C$

c.) $\int_0^4 (2v+5)(3v-1) dv = \int_0^4 (6v^2 + 13v - 5) dv = \left[2v^3 + \frac{13}{2}v^2 - 5v \right]_0^4$
 $= (128 + 104 - 20) - (0) = 212$

(2) The velocity function of a particle in meters per second is given by $v(t) = 3t^2 - 4t$.

a.) Find the displacement of the particle during the time interval $[0, 2]$.

displacement = $\int_0^2 (3t^2 - 4t) dt = \left[t^3 - 2t^2 \right]_0^2 = (8 - 8) - (0) = 0$

b.) Find the total distance traveled by the particle during the time interval $[0, 2]$.

$v(t) = 3t^2 - 4t = t(3t - 4)$

So, $|v(t)| = \begin{cases} 3t^2 - 4t & \text{if } t < 0 \\ -3t^2 + 4t & \text{if } 0 \leq t \leq 4/3 \\ 3t^2 - 4t & \text{if } t > 4/3 \end{cases}$

	$(-\infty, 0)$	$(0, 4/3)$	$(4/3, \infty)$
$v(t)$	+	-	+

total dist. travelled = $\int_0^2 |v(t)| dt = \int_0^{4/3} (-3t^2 + 4t) dt + \int_{4/3}^2 (3t^2 - 4t) dt$
 $= \left[-t^3 + 2t^2 \right]_0^{4/3} + \left[t^3 - 2t^2 \right]_{4/3}^2 = \left(\frac{2}{27} - 0 \right) + \left(0 + \frac{2}{27} \right)$
 $= \frac{4}{27} \text{ m.}$