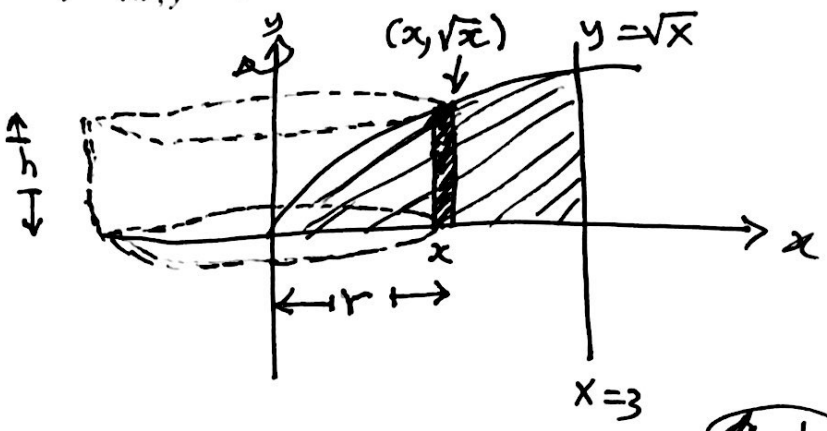
Name: KEY ID: KEY Sec: 9AM , 10AM

MATH-102 Term-152 CQ7 **(show all your work & write final answer in the box)**

1) Using the method of cylindrical shells, set up (but DO NOT EVALUATE) an integral for the volume of the solid generated by revolving

(a) The region enclosed by the curves $y=\sqrt{x}$, $y=0$, $x=3$ about the y-axis [sketch the region and a typical rectangle]



$r = x$

$h = \sqrt{x}$

$$V = \int_a^b 2\pi r h$$

$$= \int_0^3 2\pi (x)(\sqrt{x})\, dx$$

4pts

2pts (2pts) (2pts)

(b) Find the value(s) of c which satisfy the mean value theorem for integrals where $f(x) = \sin x$ over the interval $[\frac{\pi}{6}, \frac{\pi}{2}]$

$$f_{avg} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

$$= \frac{1}{\frac{\pi}{2}-\frac{\pi}{6}} \int_{\pi/6}^{\pi/2} \sin x\, dx \quad (2) = \frac{1}{\frac{3\pi-\pi}{6}} \left[-\cos x\right]_{\pi/6}^{\pi/2} \quad (2)$$

$$= \frac{1}{\pi/3}\left[-\cos\frac{\pi}{2} + \cos\frac{\pi}{6}\right] = \frac{3}{\pi}\cos\frac{\pi}{6} = \frac{3}{\pi}\frac{\sqrt{3}}{2}$$

(2)

by mean Value thm for integrals there exists c such that

$$f(c) = f_{avg} \Rightarrow \sin c = \frac{3\sqrt{3}}{2\pi} \Rightarrow c = \sin^{-1}\left(\frac{3\sqrt{3}}{2\pi}\right)$$

(2) (2)