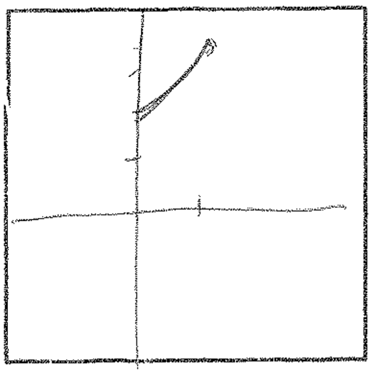
Slightly long, hard $\bar{x} = 17.7$, $m = 17$ attend 27 w/ First @ 19, 22, 24; back @ 25, 26; ~~wed = 26~~; 3 left at 32   21

MATH 131
Quiz VIII
December 3, 1993

Name Key

1. Sketch the curve $y = 2x^{3/2} + 2$ between (0,2) and (1,4), and compute its length.

8



$f'(x) = 2 \cdot \frac{3}{2} x^{1/2}$

$\int_0^1 \sqrt{1+(3\sqrt{x})^2}\,dx = \int_0^1 \sqrt{1+9x}\,dx$

$u = 1+9x$, $du = 9\,dx$, $\frac{1}{9}du = dx$

$= \int_1^{10} \sqrt{u}\,\frac{1}{9}du = \frac{1}{9}\frac{u^{3/2}}{3/2}\Big|_1^{10}$

$= \frac{2}{27}(10^{3/2} - 1) = 2.268$

1 all close, but ∫

2. A force of 20 lbs. is required to hold a spring extended 2 feet beyond its natural length. How much work is done stretching it from rest to an extension of 3 feet?

8

$F(x) = kx$
$F(2) = 20$
$20 = k(2)$
$k = 10$
$F(x) = 10x$

$W = \int_0^3 10x\,dx = \frac{10x^2}{2}\Big|_0^3$

$= 45$ ft-lbs

7 all

1/3 blank

3. A solid is generated by revolving the region shown about the y-axis. Find its volume.

9

$\int_1^3 2\pi x(x^2 - 4x + 6)\,dx$

~~$= 2\pi \int (x^3 - 4x^2 + 6x)\Big|_1^3 dx$~~

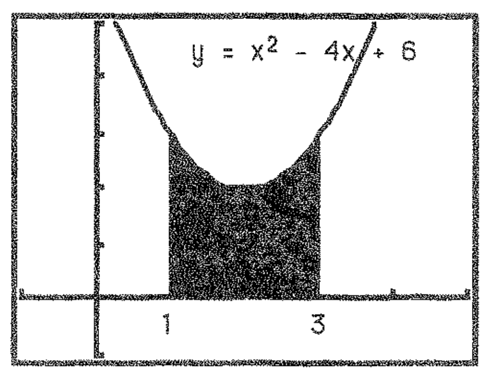
~~$= 2\pi(27 - 36 + 18) - 2\pi(1 - 4 + 6)$~~

~~$= 2\pi(9 - 3) = 12\pi$~~

$2\pi\left(\frac{x^4}{4} - \frac{4x^3}{3} + \frac{6x^2}{2}\right)\Big|_1^3 = 2\pi\left(\frac{81}{4} - 36 + 27\right) - 2\pi\left(\frac{1}{4} - \frac{4}{3} + 3\right)$

$2\pi\left(\frac{80}{4} + \frac{4}{3} - 3 - 9\right) = 2\pi\left(20 - 12 + \frac{4}{3}\right)$

$2\pi\left(8 + \frac{4}{3}\right) = \frac{56\pi}{3}$

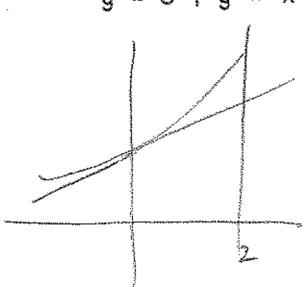


1/2 disk disk

4 all

4. A solid is generated by revolving about the x-axis the region bounded by the curves $y = e^x$, $y = x+1$, $x = 2$. Compute its volume. [Hint: sketch the graph.]

8



$\int_0^2 \pi(e^x)^2 - \pi(x+1)^2\,dx$

$= \int_0^2 \pi e^{2x}\,dx - \pi(x+1)^2\,dx$

$= \pi \frac{e^{2x}}{2}\Big|_0^2 - \pi\frac{(x+1)^3}{3}\Big|_0^2$

$= \pi\frac{e^4}{2} - \frac{\pi}{2}e^0 - \pi\frac{3^3}{3} + \frac{\pi}{3}$

$= \pi\left(\frac{e^4}{2} - \frac{1}{2} - 9 + \frac{1}{3}\right) = \pi\left(\frac{e^4}{2} + \frac{1}{3} - 9 - \frac{1}{6}\right)$

$= \pi\left(\frac{e^4}{2} - \frac{55}{6}\right) \approx 18.132\pi \approx 56.96$

$e^4/2 - 8/3 + 6$, $8^2/3$

2 all, 10 trouble with int