Math 1172

Homework #2

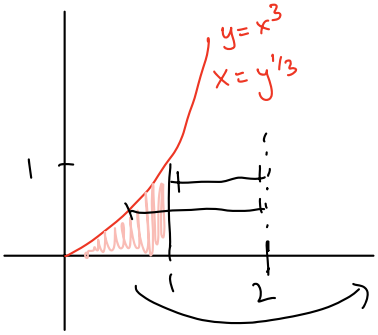
Section 5.2 #15

Section 5.3 #2

Section 6.1

(8th ed numbers)

5.2 #15 $y = x^3$, $y = 0$, $x = 1$ about $x = 2$



inner = 1

outer = $2 - y^{1/3}$

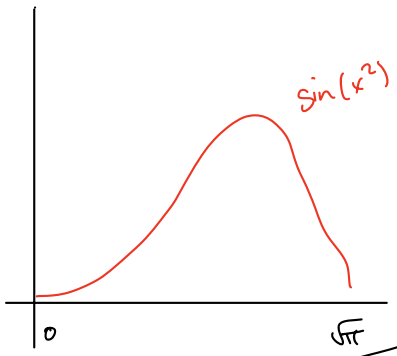
$$\pi \int_0^1 (2 - y^{1/3})^2 - 1^2 \, dy = \pi \int_0^1 4 - 4y^{1/3} + y^{2/3} - 1 \, dy$$

$$= \pi \int_0^1 3 - 4y^{1/3} + y^{2/3} \, dy$$

$$= \pi \left(3y - 4 \cdot \frac{3}{4} y^{4/3} + \frac{3}{5} y^{5/3} \right) \Big|_0^1$$

$$= \pi \left(3 - 3 + \frac{3}{5} \right) = \frac{3\pi}{5}$$

5.3 #2



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

$u = x^2$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$$= 2\pi \int x \sin u\,dx = 2\pi \int \sin u \cdot x\,dx = 2\pi \int \sin u \cdot \frac{1}{2}du$$

$$= \frac{1}{2} \cdot 2\pi \int \sin u\,du = -\pi \cos u = -\pi \cos(x^2) \Big|_0^{\sqrt{\pi}}$$

$$= -\pi \cos(\pi) - -\pi \cos 0 = -\pi \cdot (-1) + \pi \cdot 1 = 2\pi$$

6.1 #18 $\quad f(x) = x^5 + x^3 + x$

$f^{-1}(3) = 1$ (this is a guess, since I can tell $f(1) = 3$)

$f(f^{-1}(2)) = 2$, since $f(f^{-1}(x))$ is always x.

6.1 #39 $\quad f(x) = 3x^3 + 4x^2 + 6x + 5$, find $(f^{-1})'(5)$

$$(f^{-1})'(5) = \frac{1}{f'(f^{-1}(5))}$$

$f^{-1}(5) = 0$, since $f(0) = 5$.

$$= \frac{1}{f'(0)}$$

$f'(x) = 9x^2 + 8x + 6$

$f'(0) = 6$

$$= \boxed{\frac{1}{6}}$$