7.3 Homework #3, 5, 7, 11, 19

Cylinder Volume = $2\pi rh\,\Delta r$

#3 $y = \sqrt[3]{x}$ $y=0$ $x=1$

$$\int_0^1 2\pi x\left(\sqrt[3]{x}-0\right)dx \qquad 2\pi\left[\frac{3}{7}x^{\frac{7}{3}}\right]_0^1$$

$$2\pi\left(\frac{3}{7}\right) = \boxed{\frac{6\pi}{7}}$$

$$2\pi\left|2x^3 - \frac{3}{4}x^4\right|_0^2$$

$$2\pi\left[16 - \frac{3}{4}16\right]$$

$$2\pi\left[16-12\right] = \boxed{8\pi}$$

#5. $y = e^{-x^2}$ $y=0$ $x=0$ $x=1$

$$\int_0^1 2\pi x\left(e^{-x^2}\right)dy$$

$$\pi\left|-e^{-0}\right|_0^1 \qquad \boxed{\pi\left(1-\frac{1}{e}\right)}$$

#7 $y = x^2$ $y = 6x - 2x^2$

$$2\pi x\left(6x^2 - 2x^2 - x^2\right)dx$$

$$x^2 = 6x - 2x^2$$

$$-x^2$$

$$0 = 6x - 3x^2 \qquad 3x(2-x)$$

$$x=0$$

$$x=2$$

$$2\pi\int_0^2 x\left[\left(6x^2-2x^2\right)-x^2\right]dx$$

$$6x^2 - 2x^3 - x^3 = 6x^2 - 3x^3$$

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#11. $y = x^3$, $y = 8$, $x = 0$

$x = \sqrt[3]{y}$

$$2\pi \int_0^8 y\left[(\sqrt[3]{y}) - 0()\right]$$

$$2\pi \int_0^8 y^{4/3}\,dy = 2\pi \left| \frac{3}{7} y^{7/3} \right|_0^8$$

$$2\pi\left[\frac{3}{7}(8)^{7/3} - 0\right] = \frac{6\pi}{7} 2^7 = \boxed{\frac{768}{7}\pi}$$

#19. $y = x^3$, $y = 0$, $x = 1$, about $y = 1$ $\quad 1 - y \quad 1 - y^{1/3}$

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

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

$$2\pi \left| y - \frac{1}{2} y^2 - \frac{3}{4} y^{4/3} + \frac{3}{7} y^{7/3} \right|_0^1$$

$$2\pi\left[1 - \frac{1}{2} - \frac{3}{4}(1)^{4/3} + \frac{3}{7}(1)^{7/3} - 0\right]$$

$$2\pi\left[\frac{5}{28}\right] = \boxed{\frac{5}{14}\pi}$$