6.1

43. $f(x) = \cos x$, $g(x) = 2 - \cos x$, $0 \le x \le 2\pi$

$\cos x = 2 - \cos x$

$2\cos x = 2$

$\cos x = 1$

$x = 0, 2\pi$

$\cos \pi = -1$

$2 - \cos \pi = 3$

$$\int_0^{2\pi} (g(x) - f(x))\,dx$$

$$= \int_0^{2\pi} (2 - 2\cos x)\,dx =$$

$$2x - 2\sin x \Big|_0^{2\pi} = \boxed{4\pi}$$

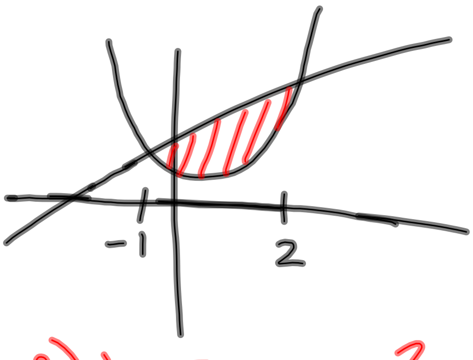
19. $f(x) = x^2 + 2x + 1$; $g(x) = 3x + 3$

$x^2 + 2x + 1 = 3x + 3$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$x = -1, 2$



$$\int_{-1}^{2} (g - f)\,dx =$$

$$\int_{-1}^{2} (-x^2 + x + 2)\,dx = -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 2x \Big|_{-1}^{2}$$

$$-\frac{8}{3} + 2 + 4 - \left(\frac{1}{3} + \frac{1}{2} - 2\right) \cdots$$

5. $f(x) = 3(x^3 - x)$

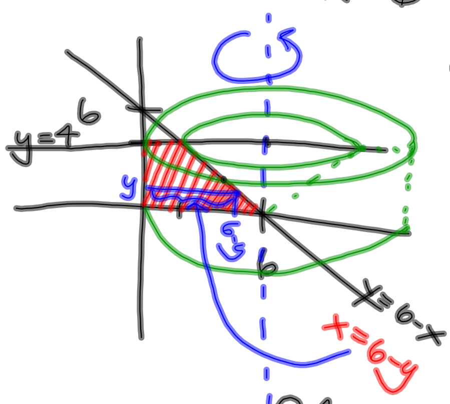
$g(x) = 0$

$$\int_{-1}^{0} 3(x^3 - x)\,dx + \int_{0}^{1} -3(x^3 - x)\,dx$$

6.2

20. $y = 6 - x$, $y = 0$, $y = 4$, $x = 0$

around $x = 6$



outer cylinder:

$\pi(6^2) \cdot 4 = 144\pi$

cone:

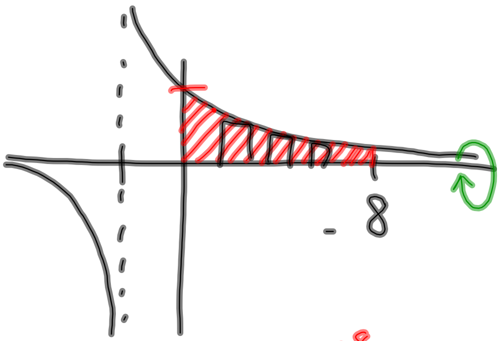
$\pi\left(6 - (6-y)\right)^2 \Delta y$

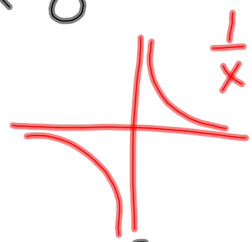
$$144\pi - \int_0^4 \pi y^2\,dy = 144\pi - \left(\frac{\pi}{3} y^3\Big|_0^4\right)$$

$$= \boxed{144\pi - \frac{64\pi}{3}}$$

26. $y = \dfrac{3}{x+1}$, $y=0$, $x=0$, $x=8$

revolve about x-axis





$$\int_0^8 \pi \left(\frac{3}{x+1}\right)^2 dx$$

$$= \int_0^8 \frac{9\pi\, dx}{(x+1)^2} = \int_{x=0}^{8} 9\pi u^{-2} du = -\frac{9\pi}{u}\Big|_{x=0}^{8} =$$

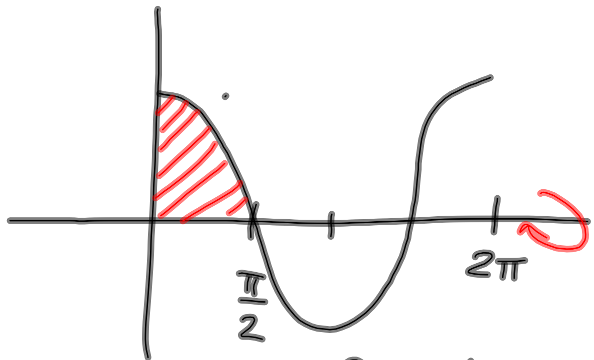
$u = x+1$
$du = dx$

$$= \frac{-9\pi}{x+1}\Big|_0^8 = -\pi - (-9\pi)$$

$$= \boxed{8\pi}$$

34. $y = \cos x$, $y=0$, $x=0$, $x=\frac{\pi}{2}$

revolve about x-axis



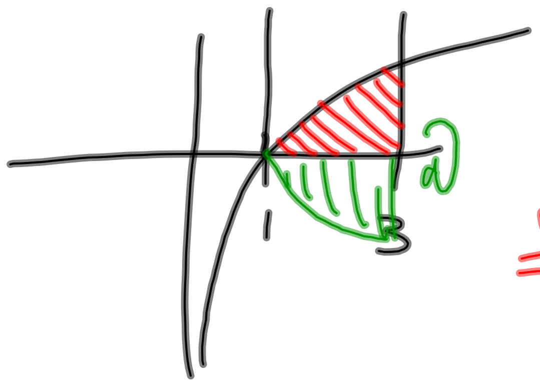
$$\int_0^{\frac{\pi}{2}} \pi (\cos x)^2 dx$$

∫(π(cos(x))^2, x, 0, π/2)

$$\boxed{\frac{\pi^2}{4}} \approx \boxed{2.4674}$$

36. $y = \ln x$, $y = 0$, $x = 1$, $x = 3$

about x-axis



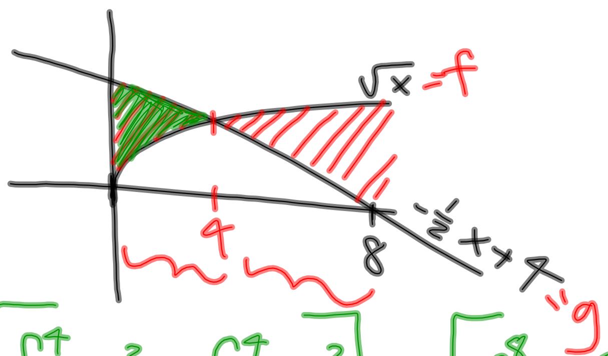
$$\int_1^3 \pi (\ln x)^2 \, dx$$

$$= \left[3(\ln 3)^2 - 6\ln 3 + 4\right] \cdot \pi$$

$$\approx 3.2332$$

30. $y = \sqrt{x}$, $y = -\frac{1}{2}x + 4$, $x = 0$, $x = 8$

about x-axis $\quad \sqrt{x} = -\frac{1}{2}x + 4$



$$\left[\int_0^4 \pi g^2 - \int_0^4 \pi f^2\right] + \left[\int_4^8 \pi f^2 - \int_4^8 \pi g^2\right]$$

6.2 # 11, 13, 17, 19, 21, 25, 29, 35