5.4 #3, 4, 9, 10, 19, 25, 28, 33, 34, 38, 44

3) $\int_0^4 \left(3x - \frac{x^3}{4}\right) dx$

$= \frac{3x^2}{2} - \frac{x^4}{16} \Big|_0^4 = \frac{3}{2}(4)^2 - \frac{1}{16}(4)^4 - \frac{3}{2}0^2 - \frac{0^4}{16}$

$= \frac{3 \cdot 16}{2} - \frac{(16)^2}{16}$

$= 24 - 16 = \boxed{8}$

4) $\int_{-2}^{2} x^3 - 2x + 3\, dx$

$= \frac{x^4}{4} - x^2 + 3x \Big|_{-2}^{2} = \frac{2^4}{4} - 2^2 + 3(2) - \left[\frac{(-2)^4}{4} - (-2)^2 + 3(-2)\right]$

$= \cancel{\frac{16}{4}} - \cancel{4} + 6 - \left[\cancel{\frac{16}{4}} - \cancel{4} - 6\right] = \boxed{12}$

9) $\int_0^{\pi} \sin(x)\, dx = -\cos x \Big|_0^{\pi}$

$= -\cos(\pi) - (-\cos(0))$

$= -(-1) - (-1) = \boxed{2}$

10) $\int_0^{\pi} 1 + \cos x\, dx = x + \sin x \Big|_0^{\pi}$

$= \pi + \sin\pi - (0 + \sin 0)$

$= \pi + 0 - 0 = \boxed{\pi}$

19a) $\int_1^{-1} (r+1)^2 \, dr$

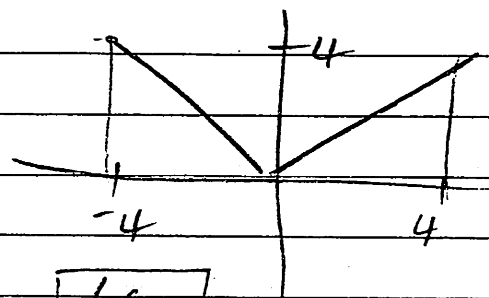
$= \int_1^{-1} r^2+2r+1 \, dr$

$= \frac{r^3}{3}+r^2+r \Big|_1^{-1}$

$= \frac{(-1)^3}{3} + \cancel{(-1)^2} - 1 - \left(\frac{1}{3}+\cancel{1}+1\right)$

$= -1/3 - 1/3 - 2 = \boxed{-8/3}$

25) $\int_{-4}^{4} |x| \, dx$



$= 2\left(\frac{1}{2} 4 \cdot 4\right) = \boxed{16}$

28) $\frac{d}{dx}\int_1^{\sin x} 3t^2\,dt$

a) $\int_1^{\sin x} 3t^2\,dt = t^3\Big|_1^{\sin t}$

$= (\sin x)^3 - 1$

$\frac{d}{dx}\int_1^{\sin x} 3t^2\,dt = \frac{d}{dx}\left(\sin^3 x - 1\right)$

$= 3\sin^2 x \cdot \left(\frac{d}{dx}\sin t\right)$

$= \boxed{3\sin^2 x \cos x}$

b) $\frac{d}{dx}\int_1^{\sin x} 3t^2\,dt$

$= 3\sin^2 x \cdot \frac{d}{dx}\sin x$

$= \boxed{3\sin^2 x \cos x}$

33) $y = \int_{\sqrt{x}}^{0} \sin(t^2)\,dt = -\int_0^{\sqrt{x}} \sin(t^2)\,dt$

$\frac{dy}{dx} = -\sin((\sqrt{x})^2) \cdot \frac{d}{dx}\sqrt{x}$

$= -\sin(x)\,\frac{x^{-1/2}}{2} = \boxed{-\frac{\sin x}{2\sqrt{x}}}$

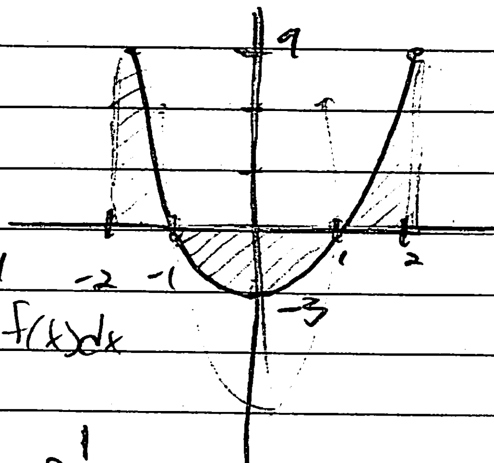
34) $y = \int_0^{x^2} \cos\sqrt{t}\, dt$

$$\frac{dy}{dx} = \cos\sqrt{x^2} \cdot \frac{d}{dx}(x^2)$$

$$= \cos(x) \cdot 2x = \boxed{2x\cos x}$$

38) $y = 3x^2 - 3, \quad -2 \le x \le 2$

$$= 3(x+1)(x-1)$$



Total area: $2\int_1^2 f(x)dx - \int_{-1}^1 f(x)dx$

$$= 2\int_1^2 3(x^2-1)dx - \int_{-1}^1 3(x^2-1)dx$$

$$= 6\int_1^2 x^2-1\,dx - 3\int_{-1}^1 x^2-1\,dx$$

$$= 6\left(\frac{x^3}{3}-x\right)\Big|_1^2 - 3\left(\frac{x^3}{3}-x\right)\Big|_{-1}^1$$

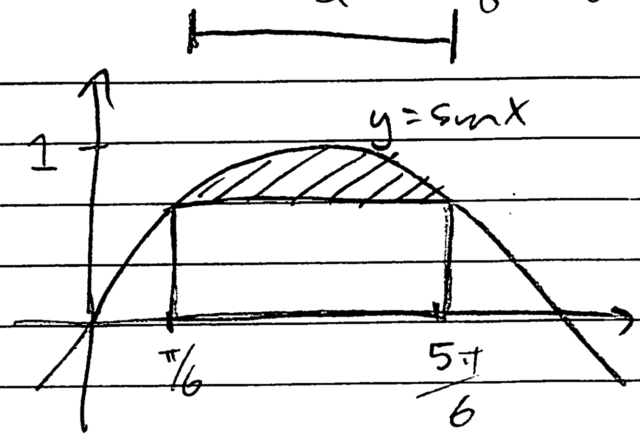
$$= 6\left(\frac{8}{3}-2-\left(\frac{1}{3}-1\right)\right) - 3\left(\frac{1}{3}-1-\left(\frac{-1}{3}+1\right)\right)$$

$$= 6\left(\frac{7}{3}-1\right) - 3\left(\frac{2}{3}-2\right) = 14-6-2+6$$

$$= \boxed{12}$$

$$l = \frac{5\pi}{6} - \frac{\pi}{6} = \frac{4\pi}{6} = \frac{2\pi}{3}$$

44)



$$w = \sin \pi/6 = \frac{1}{2}$$

$$\text{Area} = \int_{\pi/6}^{5\pi/6} \sin x \, dx - \frac{2\pi}{3} \cdot \frac{1}{2}$$

$$= -\cos x \Big|_{\pi/6}^{5\pi/6} - \pi/3$$

$$= -\cos\left(5\pi/6\right) - \left(-\cos \pi/6\right) - \pi/3$$

$$= -\left(-\frac{\sqrt{3}}{2}\right) - \left(-\frac{\sqrt{3}}{2}\right) - \pi/3$$

$$= \boxed{\sqrt{3} - \pi/3}$$