6.1   HW setups

2) $\int_0^2 \left(\sqrt{x+2} - \frac{1}{x+1} \right) dx$

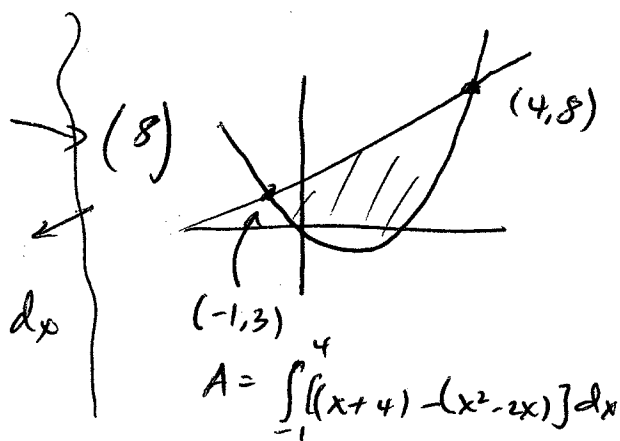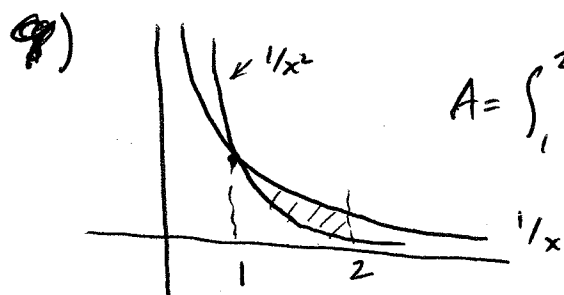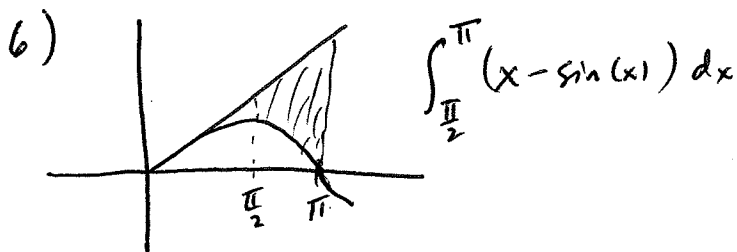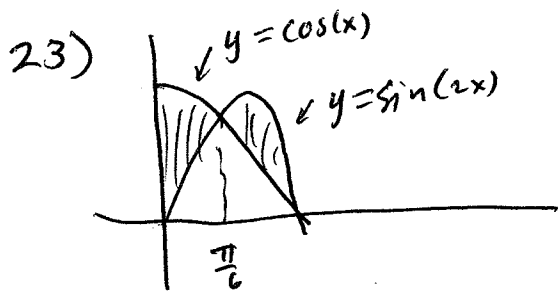4) $\int_0^3 \left((2y-y^2) - (y^2-4y) \right) dy$

6)

$\int_{\frac{\pi}{2}}^{\pi} (x - \sin(x)) dx$

(8)

$(4,8)$

$(-1,3)$

$A = \int_{-1}^{4} [(x+4) - (x^2-2x)] dx$

9)

$1/x^2$

$1/x$

$A = \int_1^2 \left(\frac{1}{x} - \frac{1}{x^2} \right) dx$

10)

$\int_0^{\pi/2} \left(\sin(x) - \frac{2}{\pi} x \right) dx$

22)

$y = x^3$

$y = x$

origin

$A = \int_{-1}^{0} x^3 - x \, dx + \int_0^1 x - x^3 \, dx$

$= 2 \int_0^1 x - x^3 \, dx$ (symmetry)
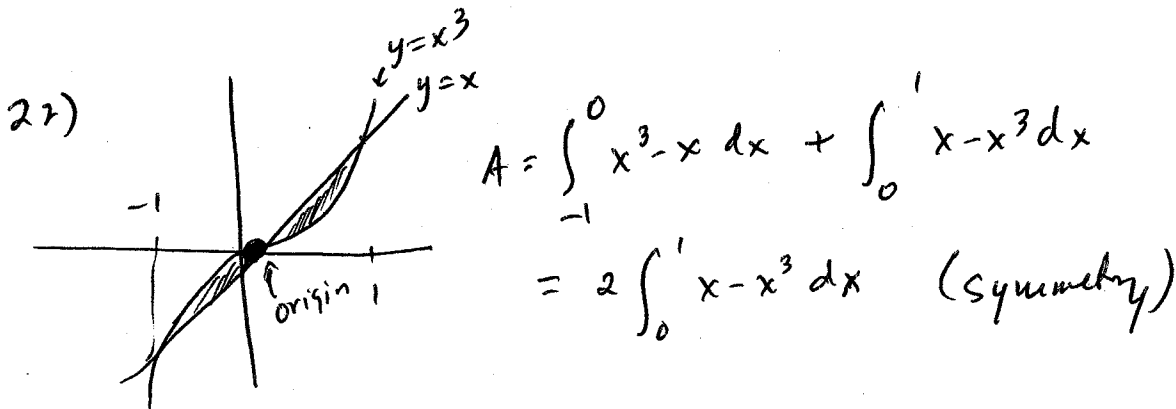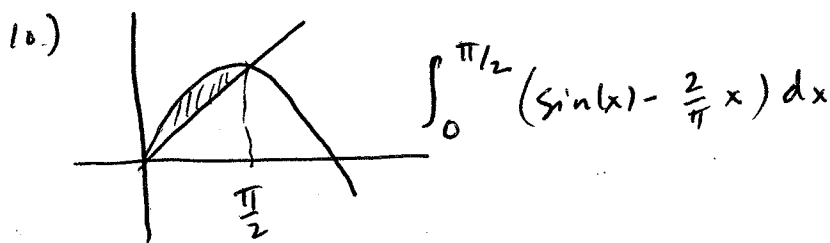
6.1 setups, continued

23)

$y = \cos(x)$
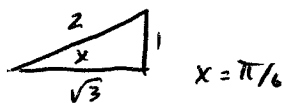
$y = \sin(2x)$

$\frac{\pi}{6}$

Intersection:

$$\cos(x) = \sin(2x) = 2\sin(x)\cos(x)$$

$$\Rightarrow \cos(x)(2\sin(x) - 1) = 0$$

$$\cos(x) = 0 \quad \text{or} \quad \sin(x) = \tfrac{1}{2}$$
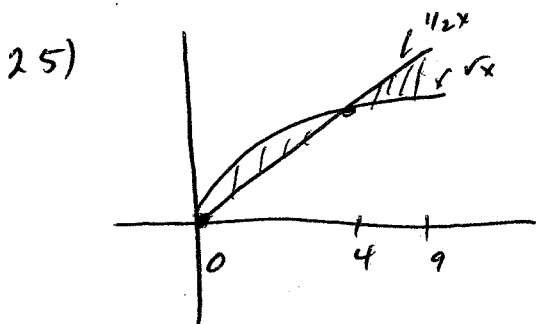
$x = \pi/6$

$$A = \int_0^{\pi/6} \cos(x) - \sin(2x)\, dx + \int_{\pi/6}^{\pi/2} \sin(2x) - \cos(x)\, dx$$

24)

$$\cos(x) = 1 - \cos(x) \Rightarrow 2\cos(x) = 1 \quad \cos(x) = \tfrac{1}{2}$$

$$x = \pi/3$$

$1 - \cos(x)$

$\pi/3$

π

$\cos(x)$

$$\int_0^{\pi/3} \cos(x) - (1 - \cos(x))\, dx + \int_{\pi/3}^{\pi} (1 - \cos(x)) - \cos(x)\, dx$$

25)

$\tfrac{1}{2}x$

$\sqrt{x}$

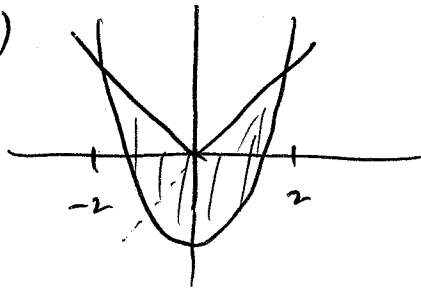0 4 9
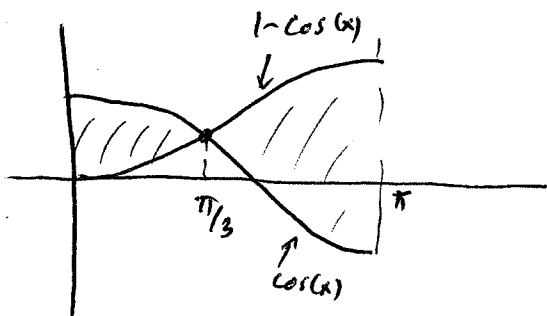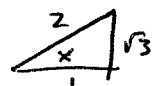
Intersection: $\sqrt{x} = \frac{x}{2}$

$$x = \frac{x^2}{4} \Rightarrow x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$$x = 0, \; x = 4$$

$$\int_0^4 \sqrt{x} - \tfrac{1}{2}x\, dx + \int_4^9 \tfrac{1}{2}x - \sqrt{x}\, dx$$

26)

intersection:
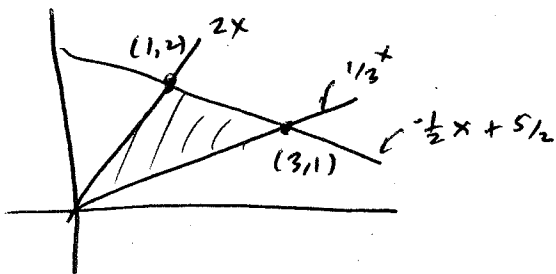
$x > 0:$

$x = x^2 - 2$

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

$x = 2$

By symmetry, $x = -2$ is the other, and

$$A = \int_{-2}^{2} |x| - (x^2 - 2) \, dx$$
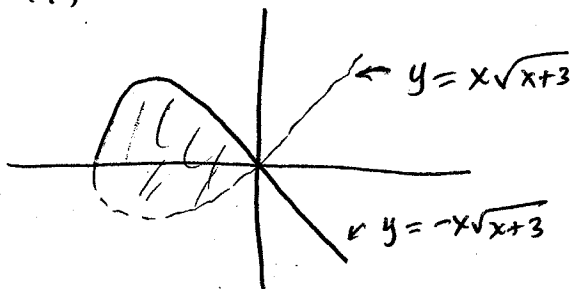
$$= 2\int_{0}^{2} x - (x^2 - 2) \, dx$$

29)

$$A = \int_{0}^{1} (2x - \tfrac{1}{3}x) \, dx + \int_{1}^{3} (-\tfrac{1}{2}x + \tfrac{5}{2}) - \tfrac{1}{3}x \, dy$$

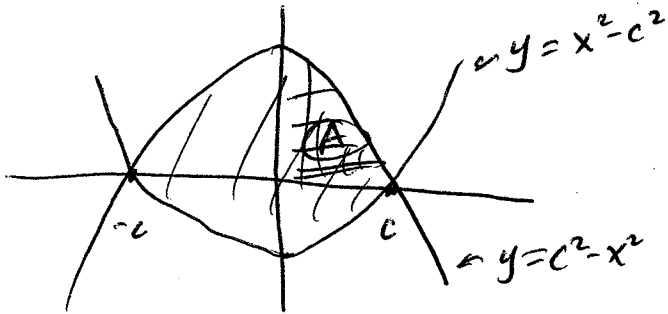45) $A \approx M_5 = \dfrac{200 - 0}{5} \left[h(20) + h(60) + h(100) + h(140) + h(180) \right]$

49)

For the loop, we take:

$$2\int_{-3}^{0} (-x\sqrt{x+3}) \, dx$$

Then let $u = x + 3$, & so on.

53.

$y = x^2 - c^2$

$-c$ c

$y = c^2 - x^2$

By symmetry, we could take

$$A = 4 \int_0^c c^2 - x^2 \, dx = 576$$

$$\frac{8}{3} c^3 = 576$$

$$c^3 = 216$$

$$c = \sqrt[3]{216} = \boxed{6}$$