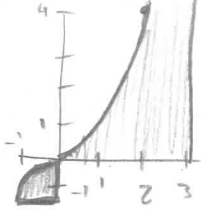
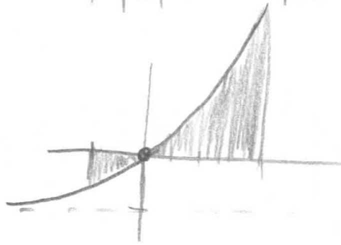
7.4 8/5/14

(35) $f(x) = x^3$, $[-1,3]$



$$\int_{-1}^{0} -x^3\,dx + \int_0^3 x^3\,dx = -\frac{x^4}{4}\Big|_{-1}^{0} + \frac{x^4}{4}\Big|_0^3 = \frac{1}{4} + \frac{81}{4} = \frac{41}{2}$$

(37) $f(x) = e^x - 1$, $[-1,2]$

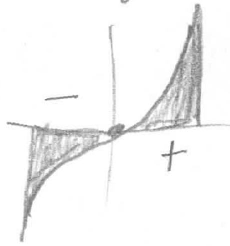


$$\int_{-1}^{0}(1-e^x)\,dx + \int_0^2 (e^x - 1)\,dx = x - e^x\Big|_{-1}^{0} + e^x - x\Big|_0^2$$

$$= -1 - (-1 - e^{-1}) + e^2 - 2 - 1 = e^2 + \frac{1}{e} - 3$$

(54) (a) $\int_{-5}^{5} x(x^2+3)^7\,dx = \int_{28}^{28} \frac{1}{2} u^7\,du = \frac{u^8}{16}\Big|_{28}^{28} = 0$

(b) $x(x^2+3)^7$ is <u>odd</u> $f(-x) = -f(x)$ and we're integrating over $[-5,5]$: $\int_{-5}^{0} f(x)\,dx = -\int_0^5 f(x)\,dx$.



(59) (a) $\int_1^2 \left(.6 + \frac{4}{(t+1)^3}\right)dt = .6t - \frac{2}{(t+1)^2}\Big|_1^2$

$= \frac{79}{90}$ ft

(b) $\int_2^3 \left(.6 + \frac{4}{(t+1)^3}\right)dt = .6t - \frac{2}{(t+1)^2}\Big|_2^3 = \frac{6275}{9000} = \frac{251}{360}$

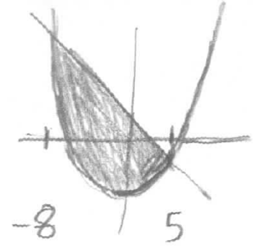
7.5

(7) $y = x^2 - 30,\ y = 10 - 3x$

$x^2 - 30 = 10 - 3x$

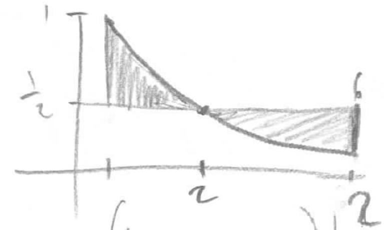
$x^2 + 3x - 40 = 0$

$(x+8)(x-5) = 0$



$$\int_{-8}^{5} \left[(10-3x) - (x^2-30)\right] dx$$

$$= -\frac{x^3}{3} - \frac{3x^2}{2} + 40x \Big|_{-8}^{5} = 366.1\overline{6}$$



(11) $x = 1,\ x = 6,\ y = \frac{1}{x},\ y = \frac{1}{2}$

$$\int_1^2 \left(\frac{1}{x} - \frac{1}{2}\right) dx + \int_2^6 \left(\frac{1}{2} - \frac{1}{x}\right) dx = \left(\ln|x| - \frac{x}{2}\right)\Big|_1^2 + \left(\frac{x}{2} - \ln|x|\right)\Big|_2^6$$

$$= (\ln 2 - 1) - \left(0 - \frac{1}{2}\right) + (3 - \ln 6) - (1 - \ln 2)$$

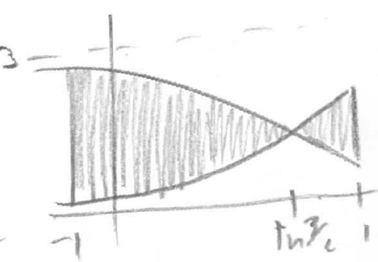
$$= 2\ln 2 + \frac{3}{2} - \ln 6$$

(13) $x = -1,\ x = 1,\ y = e^x,\ y = 3 - e^x$

$3 - e^x = e^x$

$\frac{3}{2} = e^x$

$x = \ln\frac{3}{2}$



$$\int_{-1}^{\ln 3/2} (3 - e^x - e^x)\, dx + \int_{\ln 3/2}^{1} \left(e^x - (3 - e^x)\right) dx$$

$$= 3x - 2e^x \Big|_{-1}^{\ln 3/2} + 2e^x - 3x \Big|_{\ln 3/2}^{1}$$

$$= \left(3\ln\frac{3}{2} - 2\cdot\frac{3}{2}\right) - \left(-3 - \frac{2}{e}\right) + (2e - 3) - \left(2\cdot\frac{3}{2} - 3\ln\frac{3}{2}\right)$$

$$= 6\ln\frac{3}{2} + \frac{2}{e} + 2e - 6$$

(17) $y = x^3 - x^2 + x + 1, \; y = 2x^2 - x + 1$

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

$x^3 - 3x^2 + 2x = 0$

$x(x^2 - 3x + 2) = 0$

$x(x-2)(x-1) = 0, \quad x = 0, 1, 2$

$$\int_0^1 \left[(x^3 - x^2 + x + 1) - (2x^2 - x + 1)\right] dx$$

$$+ \int_1^2 \left[(2x^2 - x + 1) - (x^3 - x^2 + x + 1)\right] dx$$

$$= \frac{x^4}{4} - x^3 + x^2 \Big|_0^1 + \frac{-x^4}{4} + x^3 - x^2 \Big|_1^2$$

$$= \left(\frac{1}{4} \cancel{-1} \cancel{+1}\right) - 0 + \cancel{(-4 + 8 - 4)} - \left(-\frac{1}{4} \cancel{+1} \cancel{-1}\right) = \frac{1}{2}$$

(19) $y = x^4 + \ln(x+10), \; y = x^3 + \ln(x+10)$

$x^4 + \ln(x+10) = x^3 + \ln(x+10)$

$x^4 = x^3$

$x^3(x-1) = 0$

$x = 0, 1$

$$\int_0^1 \left[(x^3 + \ln(x+10)) - (x^4 + \ln(x+10))\right] dx$$

$$= \int_0^1 (x^3 - x^4)\, dx = \frac{x^4}{4} - \frac{x^5}{5}\Big|_0^1$$

$$= \frac{1}{4} - \frac{1}{5} = \frac{1}{20}$$

(21) $y = x^{4/3}, \; y = 2x^{1/3}$

$x^{4/3} = 2x^{1/3}$

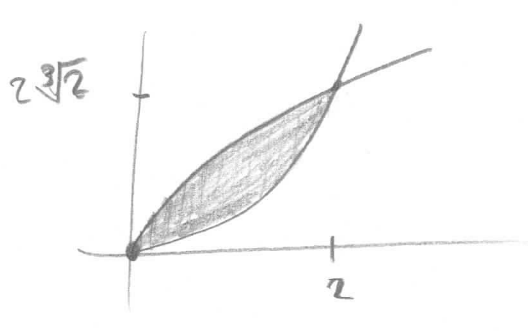
$x^{1/3}(x-2) = 0$

$x = 0, 2$

$$\int_0^2 (x^{4/3} - 2x^{1/3})\, dx$$

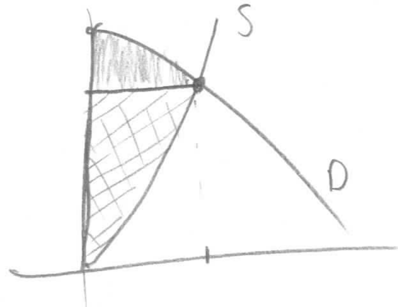
$$= \frac{3}{7}x^{7/3} - \frac{3}{2}x^{4/3}\Big|_0^2$$

$$= \frac{12\sqrt[3]{2}}{7} - 3\sqrt[3]{2}$$



(35) $S(q)=q^2+10q$, $D(q)=900-20q-q^2$

(a)



(b) $S=D \Rightarrow q^2+10q=900-20q-q^2$ $S(15)=D(15)=375$

$2q^2+30q-900=0$

$q^2+15q-450=0$

$\cancel{(q+30)}(q-15)=0$

$q=15$

(c) $\int_0^{15}(900-20q-q^2-375)\,dq = 525q-10q^2-\frac{q^3}{3}\Big|_0^{15}$

$=4500$

(d) $\int_0^{15}(375-(q^2+10q))\,dq = 375q-\frac{q^3}{3}+5q^2\Big|_0^{15}$

$=3375$