CH6 HW DAY $\boxed{101}$ § 6.2

p. 331 # 51–62, 68, 73   p. 323 # 23, 24

(51) $\int_0^3 (x^2+4x+3)\,dx = \frac{1}{3}x^3+2x^2+3x\Big|_0^3 = (9+18+9)-0 = \boxed{36}$

(52) $\int_1^3 \frac{1}{t}\,dt = \ln|t|\Big|_1^3 = \ln|3|-\ln|1| = \boxed{\ln 3}$

(53) $\int_0^{\pi/4} \sin x\,dx = -\cos x\Big|_0^{\pi/4} \quad -\left(\frac{\sqrt{2}}{2}-1\right) = \boxed{1-\frac{\sqrt{2}}{2}}$

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

(55) $\int_0^2 3e^x\,dx = 3e^x\Big|_0^2 = 3(e^2-e^1) = \boxed{3(e^2-1)}$

(56) $\int_2^5 (x^3-\pi x^2)\,dx = \frac{1}{4}x^4 - \frac{\pi}{3}x^3\Big|_2^5 = \left(\frac{5^4}{4}-\frac{5^3\pi}{3}\right)-\left(\frac{2^4}{4}-\frac{2^3\pi}{3}\right)$

$= \left(\frac{625}{4}-\frac{16}{4}\right) + \left(-\frac{125\pi}{3}+\frac{8\pi}{3}\right)$

$= \boxed{\frac{609}{4}-\frac{117\pi}{3}}$

(57) $\int_0^1 \sin\theta\,d\theta = -\cos\theta\Big|_0^1$

$= -(\cos(1)-\cos(0)) = -(\cos(1)-1) = \boxed{1-\cos(1)}$

(58) $\int_1^2 \frac{1+y^2}{y}\,dy = \int_1^2\left(\frac{1}{y}+y\right)dy = \ln|y|+\frac{1}{2}y^2\Big|_1^2$

$= \ln(2)-\ln(1) + \frac{1}{2}(4-1)$

$= \boxed{\ln(2)-\frac{3}{2}}$

(59) $\int_0^2\left(\frac{x^3}{3}+2x\right)dx = \frac{x^4}{12}+x^2\Big)\Big|_0^2 = \left(\frac{16}{12}+4\right)-(0) = \frac{4}{3}+4$

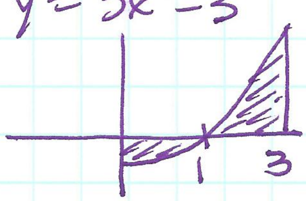
$\boxed{5\frac{1}{3} = \frac{16}{3}}$

(60) $\int_0^{\pi/4}(\sin t+\cos t)\,dt = -\cos t + \sin t\Big|_0^{\pi/4}$

$\left(-\cos\left(\frac{\pi}{4}\right)+\sin\left(\frac{\pi}{4}\right)\right) - (-\cos(0)+\sin(0))$

$\left(-\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}\right) - (-1+0) = \boxed{1}$

(68) $y = 3x^2-3$



$\int_0^3 3x^2-3\,dx = 3\int_0^3 x^2-1\,dx = 3\left(\frac{1}{3}x^3-x\right|_0^3$

$= 3((9-3)-(0)) = 3(6) = \boxed{18}$

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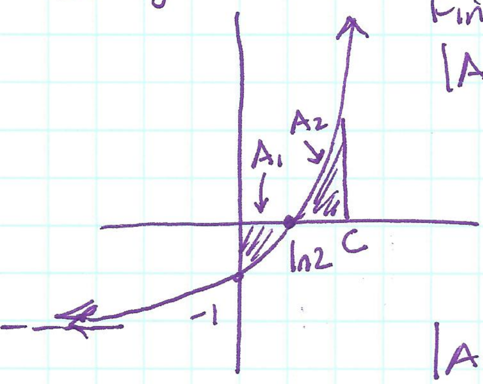
(73) $y = e^x - 2$



Find c such that
$|A_1| = |A_2|$ $\quad A_1 = \int_0^{\ln(2)} e^x - 2\,dx = e^x - 2x \Big|_0^{\ln 2}$

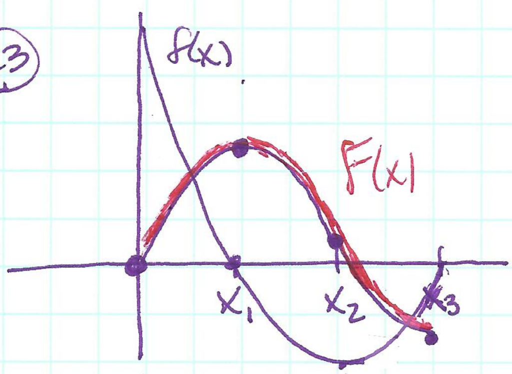
$$= (2 - \ln 4) - (1)$$
$$= 1 - \ln 4 \approx -.386$$

$$|A_1| = \int_0^{\ln(2)} |e^x - 2|\,dx = \ln(4) - 1 \approx +.386$$

$$|A_2| = \int_{\ln 2}^{c} e^x - 2\,dx = e^x - 2x \Big|_{\ln 2}^{c}$$
$$= (e^c - 2c) - (2 - \ln 4)$$
$$A_2 = e^c - 2c + \ln 4 - 2$$

$|A_1| = |A_2|$: $\quad \ln(4) - 1 = e^c - 2c + \ln(4) - 2$
$$1 = e^c - 2c$$
$$c = 1.2564312$$

(23)



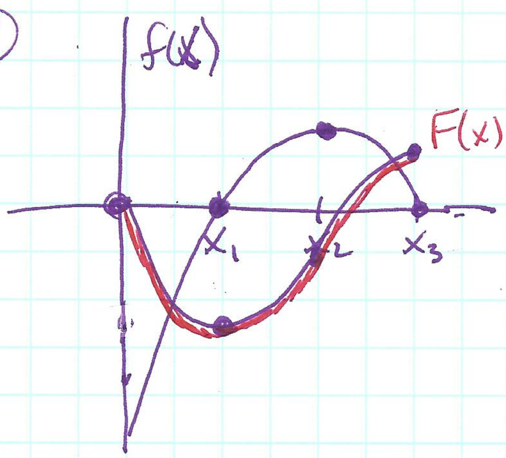
$F(0) = 0$

$F(x)$ inc $(0, x_1)$, dec (x_1, x_3)
b/c $F' = f > 0$, b/c $F' = f < 0$

$F(x)$ ccu (x_2, x_3), ccd $(0, x_2)$
b/c $F' = f$ inc, b/c $F' = f$ dec.

Local Max @ x_1 b/c $F' = f$ changes ⊕ to ⊖
Infl Pt @ x_2 b/c $F' = f$ changes dec to inc.
Possible Min @ x_3 $F' = f < 0$ so F dec (x_1, x_3)

(24)



$F(x)$ inc $(x_1 x_3)$ dec $(0, x_1)$
b/c $F' = f > 0$ ... b/c $F' = f < 0$

ccu $(0, x_2)$ ccd (x_2, x_3)
b/c $F' = f$ inc b/c $F' = f$ dec

Local min @ x_1 b/c $F' = f$ changes ⊖ to ⊕.
Infl. Pt @ x_2 b/c $F' = f$ changes inc to dec
Poss. Max @ x_3 $F' = f > 0$ so F inc from (x_1, x_3)