5.4

39 $\int_{-1}^{1} (r+1)^2 \, dr$

$u = r+1$

$du = dr$

$\int_{-1}^{1} (r^2 + 2r + 1) \, dr$

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

$\left[\frac{1}{3}(1)^3 + (1)^2 + 1\right] - \left[\frac{1}{3}(-1)^3 + (-1)^2 + (-1)\right] = \frac{2}{3} + 2 = \boxed{\frac{8}{3}}$

6.2

STUFF

$\int_{-1}^{1} (r+1)^2 \, dr \longrightarrow \int_0^2 u^2$

$\frac{1}{3} u^3$

$\frac{1}{3}(2)^3 - \frac{1}{3}(0)^3$

$\boxed{\frac{8}{3}}$

$\int_{-1}^{1} u^2$

$\Big|_{-1}^{1} \frac{1}{3} u^3$

$\Big|_{-1}^{1} \frac{1}{3} (r+1)^3$

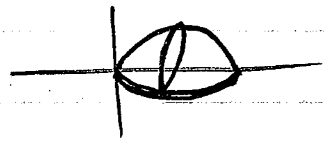
$\frac{1}{3}(1+1)^3 - \frac{1}{3}(-1+1)^3 = \frac{8}{3}$

$\frac{dr}{dx} = 2 - \frac{2}{(x+1)^2}$

$\int dr = \int \left(2 - 2(x+1)^{-2}\right) dx$

$r = 2x - 2(x+1)^{-1}$

$y = \sin x \quad [0, \pi]$



$\int_0^{\pi} x \sin x \, dx =$

Ch 7 Stuff

$y = \sqrt{8 - 2x^2}$

$u = 8 - 2x^2$

$du = -4x \, dx$

5.4

55) $\int_a^x \cancel{f(t)}\,dt + K = \int_b^x f(t)\,dt$

$-\int_a^x \cancel{f(t)}\,dt \qquad -\int_a^x f(t)\,dt$

$K = -\int_a^x f(t)\,dt + \int_b^x f(t)\,dt$

$= \int_x^a f(t)\,dt + \int_b^x f(t)\,dt$

$= \underline{\int_b^a f(t)\,dt}$

$= \int_2^{-1} x^2 - 3x + 1$

$\underline{\sin^2 x} = \sin 2x \cos 2x$

$1 - \cos^2 x$

61) $f(x) = 2 + \int_0^x \frac{10}{1+t}\,dt \qquad x = 0$

$f(0) = 2 + \int_0^0 \frac{10}{1+t}\,dt = 2$

$f'(x) = \frac{10}{1+x}$

$f'(0) = \frac{10}{1+0} = 10$

$L(x) = 2 + 10(x-0)$

$\boxed{L(x) = 2 + 10x}$

5.4

20| $y = \int_{\sin x}^{\cos x} t^2\,dt$

$= \Big|_{\sin x}^{\cos x} \frac{1}{3}t^3$

✓ $y = \frac{1}{3}\cos^3 x - \frac{1}{3}\sin^3 x$

$y' = \cancel{3}\cos^2 x\,[-\sin x] - \sin^2 x\,[\cos x]$ FTC

$y = \int_{\sin x}^{\cos x} t^2\,dt$

$y' = \cos^2 x\,[-\sin x] - \sin^2 x\,[\cos x]$

✓ $y = \int_c^{\cos x} t^2\,dt + \int_{\sin x}^{c} t^2\,dt$ SFTC

$- \int_c^{\sin x} t^2\,dt$

$y' = \cos^2 x\,[-\sin x] - \sin^2 x\,[\cos x]$

3^x 28| $\int_2^{-1} 3^x\,dx$

$3^x(\ln 3)$ $\Big|_2^{-1} \frac{3^x}{\ln 3}$

$\frac{3^{-1}}{\ln 3} - \frac{3^2}{\ln 3}$

$\frac{1}{3\ln 3} - \frac{9}{\ln 3}$

$\frac{3^x(\ln 3)}{(\ln 3)} \rightarrow 3^x$

$\frac{5x}{5} \rightarrow x$

$\int x^2$

$\frac{d}{dx}\frac{1}{3}x^3$

x^2

$\int 3^x\,dx$

$\frac{d}{dx}\frac{1}{\ln 3}3^x$

$\frac{1}{\cancel{\ln 3}}\,3^x\,\cancel{\ln 3}$

23| $\frac{dy}{dx}\ln(\sin x + 5)$

$y = \int_2^{x^2} \ln(\sin x + 5) + 3$

5.4

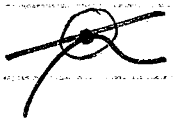
15 $y = \int_{x^3}^{5} \frac{\cos t}{t^2+2}\,dt$

$= -\int_{5}^{x^3} \frac{\cos t}{t^2+2}\,dt$

$y' = -\frac{\cos x^3}{(x^3)^2+2}\left[3x^2\right]$

$\boxed{= -\frac{3x^2 \cos x^3}{x^6+2}}$

$L(x) = f(a) + f'(a)(x-a)$



$\sqrt{4.01}$

5.4

19 $\int_{x^2}^{x^3} \cos(2t)\,dt$

$\int_{c}^{x^3} \cos(2t)\,dt + \int_{x^2}^{c} \cos(2t)\,dt$

$\int_{c}^{x^3} \cos(2t)\,dt - \int_{c}^{x^2} \cos(2t)\,dt$

$\cos(2[x^3])[3x^2] - \cos(2[x^2])[2x]$

$3x^2 \cos(2x^3) - 2x\cos(2x^2)$

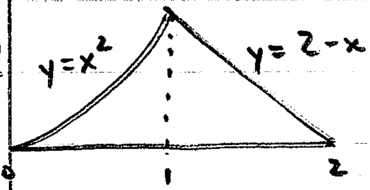
33 $\int_0^{\pi} \sin x\,dx$

$\Big|_0^{\pi} -\cos x$

$-\cos\pi - -\cos 0$

$-(-1) + 1 = 2$

45



$\int_0^1 x^2\,dx + \int_1^2 (2-x)\,dx$

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

$\left[\frac{1}{3}(1)^3 - \frac{1}{3}(0)^3\right] + \left[\left(2(2) - \frac{1}{2}(2)^2\right) - \left(2(1) - \frac{1}{2}(1)^2\right)\right]$

$\frac{1}{3} + 2 - \frac{3}{2}$

$\frac{2}{6} + \frac{12}{6} - \frac{9}{6} = \boxed{\frac{5}{6}}$

27 $\int_{1/2}^{3} \left(2 - \frac{1}{x}\right) dx$

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

$\left[2(3) - \ln 3\right] - \left[2\left(\frac{1}{2}\right) - \ln\frac{1}{2}\right]$

$6 - \ln 3 - 1 + \ln\frac{1}{2}$

$5 - \ln 3 + \ln\frac{1}{2}$

$5 + \ln\frac{\frac{1}{2}}{3}$

$5 + \ln\frac{1}{6} \to 5 + \ln 6^{-1} \to 5 - \ln 6$

5.4

55 $\int_a^x$

$$\int_a^x f(t)\,dt + K = \int_b^x f(t)\,dt - \int_a^x f(t)\,dt$$

$$-\int_a^x f(t)\,dt$$

$$K = \int_b^x f(t)\,dt + \int_x^a f(t)\,dt$$

$$= \int_b^a f(t)\,dt$$

$$= \int_2^{-1} x^2 - 3x + 1$$

$$\Big|_2^{-1} \tfrac{1}{3}x^3 - \tfrac{3}{2}(x^2) + x$$

$$\left[\tfrac{1}{3}(-1)^3 - \tfrac{3}{2}(-1)^2 + (-1)\right] - \left[\tfrac{1}{3}(2)^3 - \tfrac{3}{2}(2)^2 + 2\right]$$

$$-\tfrac{1}{3} - \tfrac{3}{2} \cancel{-1} - \tfrac{8}{3} + 6 - 2$$

$$\cancel{3} - \cancel{3} - \tfrac{3}{2} = \boxed{-\tfrac{3}{2}}$$

21 $y = \int_5^x \sin^3 t\,dt + 0$ $\quad y=0 \;,\; x=5$

40 $\int_0^4 \frac{1-\sqrt{u}}{\sqrt{u}}\,du$

$$\int_0^4 \left(\frac{1}{\sqrt{u}} - \frac{\sqrt{u}}{\sqrt{u}}\right) du$$

$$\int_0^4 \left(u^{-1/2} - 1\right) du$$

$$\Big|_0^4 \; 2u^{1/2} - u$$

$$\left[2(4)^{1/2} - 4\right] - \left[2(0)^{1/2} - 0\right]$$

$$0$$

42 $y = 3x^2 - 3 \;,\; -2 \le x \le 2$ $\quad \int_{-2}^{-1}(3x^2-3)\,dx + \int_{-1}^{1}(3x^2-3)\,dx + \int_{1}^{2}(3x^2-3)\,dx$

$3x^2 - 3 = 0$ $\quad \Big|_{-2}^{-1} x^3 - 3x + \Big|_{-1}^{1} x^3 - 3x + \Big|_{1}^{2} x^3 - 3x$

$3x^2 = 3$ $\quad \left(\left[(-1)^3 - 3(-1)\right] - \left[(-2)^3 - 3(-2)\right]\right) = 4$

$x^2 = 1$ $\quad \left(\left[(1)^3 - 3(1)\right] - \left[(-1)^3 - 3(-1)\right]\right) = -4$ $\quad$ 12

$x = \pm 1$ $\quad \left(\left[(2)^3 - 3(2)\right] - \left[(1)^3 - 3(1)\right]\right) = 4$