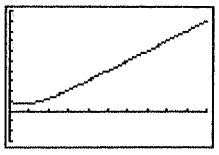
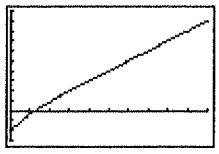
32. (a) Set $y_1 = x - y$ and use RUNKUTT with initial values $x = 0$ and $y = 1$ and step size 0.1.



[0, 10] by [−3, 10]

(b) Use RUNKUTT with initial values $x = 0$ and $y = -2$ and step size 0.1.



[0, 10] by [−3, 10]

■ Chapter 6 Review Exercises

(pp. 358 – 361)

1. $\displaystyle\int_0^{\pi/3} \sec^2\theta\, d\theta = \tan\theta\Big]_0^{\pi/3} = \tan\frac{\pi}{3} - \tan 0 = \sqrt{3}$

2. $\displaystyle\int_1^2 \left(x + \frac{1}{x^2}\right)dx = \left[\frac{1}{2}x^2 - x^{-1}\right]_1^2$

$$= \left(\frac{1}{2}(4) - \frac{1}{2}\right) - \left(\frac{1}{2} - 1\right)$$

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

$$= \frac{4}{2} = 2$$

3. Let $u = 2x + 1$

$$du = 2\,dx$$

$$\frac{1}{2}\,du = dx$$

$$\int_0^1 \frac{36}{(2x+1)^3}\,dx = 18\int_1^3 \frac{1}{u^3}\,du$$

$$= 18\left(-\frac{1}{2}\right)u^{-2}\Big]_1^3$$

$$= -9\left(\frac{1}{9} - 1\right)$$

$$= -9\left(-\frac{8}{9}\right)$$

$$= 8$$

4. Let $u = 1 - x^2$

$$du = -2x\,dx$$

$$-du = 2x\,dx$$

$$\int_{-1}^1 2x \sin(1 - x^2)\,dx = -\int_0^0 \sin u\,du = 0$$

5. Let $u = \sin x$

$$du = \cos x\,dx$$

$$\int_0^{\pi/2} 5\sin^{3/2} x \cos x\,dx = \int_0^1 5u^{3/2}\,du$$

$$= 5 \cdot \frac{2}{5}u^{5/2}\Big]_0^1$$

$$= 2(1 - 0)$$

$$= 2$$

6. $\displaystyle\int_{1/2}^4 \frac{x^2 + 3x}{x}\,dx = \int_{1/2}^4 (x + 3)\,dx \;(x \neq 0)$

$$= \left(\frac{1}{2}x^2 + 3x\right)\Big]_{1/2}^4$$

$$= \left(\frac{1}{2}(16) + 3(4)\right) - \left(\frac{1}{2}\left(\frac{1}{4}\right) + \frac{3}{2}\right)$$

$$= 20 - \left(\frac{1}{8} + \frac{12}{8}\right)$$

$$= 20 - \frac{13}{8}$$

$$= \frac{147}{8}$$

7. Let $u = \tan x$

$$du = \sec^2 x\,dx$$

$$\int_0^{\pi/4} e^{\tan x}\sec^2 x\,dx = \int_0^1 e^u\,du$$

$$= e^u\Big]_0^1$$

$$= e^1 - e^0$$

$$= e - 1$$

8. Let $u = \ln r$

$$du = \frac{1}{r}\,dr$$

$$\int_1^e \frac{\sqrt{\ln r}}{r}\,dr = \int_0^1 u^{1/2}\,du$$

$$= \frac{2}{3}u^{3/2}\Big]_0^1$$

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

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

9. Let $u = 2 - \sin x$

$$du = -\cos x\,dx$$

$$-du = \cos x\,dx$$

$$\int \frac{\cos x}{2 - \sin x}\,dx = -\int \frac{1}{u}\,du$$

$$= -\ln|u| + C$$

$$= -\ln|2 - \sin x| + C$$