

$$4. f(x) = 2x + 3x^{1.7} \Rightarrow F(x) = x^2 + \frac{3}{2.7}x^{2.7} + C = x^2 + \frac{10}{9}x^{2.7} + C$$

$$6. f(x) = \sqrt[4]{x^3} + \sqrt[3]{x^4} = x^{3/4} + x^{4/3} \Rightarrow F(x) = \frac{x^{7/4}}{7/4} + \frac{x^{7/3}}{7/3} + C = \frac{4}{7}x^{7/4} + \frac{3}{7}x^{7/3} + C$$

$$8. g(x) = \frac{5 - 4x^3 + 2x^6}{x^6} = 5x^{-6} - 4x^{-3} + 2 \text{ has domain } (-\infty, 0) \cup (0, \infty), \text{ so}$$

$$G(x) = \begin{cases} 5 \frac{x^{-5}}{-5} - 4 \frac{x^{-2}}{-2} + 2x + C_1 = -\frac{1}{x^5} + \frac{2}{x^2} + 2x + C_1 & \text{if } x < 0 \\ -\frac{1}{x^5} + \frac{2}{x^2} + 2x + C_2 & \text{if } x > 0 \end{cases}$$

$$10. f(x) = 3e^x + 7 \sec^2 x \Rightarrow F(x) = 3e^x + 7 \tan x + C_n \text{ on the interval } (n\pi - \frac{\pi}{2}, n\pi + \frac{\pi}{2}).$$

$$11. f(x) = 2x + 5(1 - x^2)^{-1/2} = 2x + \frac{5}{\sqrt{1 - x^2}} \Rightarrow F(x) = x^2 + 5 \sin^{-1} x + C$$

$$17. f''(x) = 1 + x^{4/5} \Rightarrow f'(x) = x + \frac{5}{9}x^{9/5} + C \Rightarrow \\ f(x) = \frac{1}{2}x^2 + \frac{5}{9} \cdot \frac{5}{14}x^{14/5} + Cx + D = \frac{1}{2}x^2 + \frac{25}{126}x^{14/5} + Cx + D$$

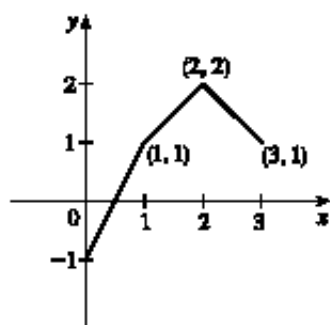
$$18. f''(x) = \cos x \Rightarrow f'(x) = \sin x + C \Rightarrow f(x) = -\cos x + Cx + D$$

$$22. f'(x) = 4/\sqrt{1-x^2} \Rightarrow f(x) = 4 \sin^{-1} x + C. f(\frac{1}{2}) = 4 \sin^{-1}(\frac{1}{2}) + C = 4 \cdot \frac{\pi}{6} + C \text{ and } f(\frac{1}{2}) = 1 \Rightarrow \\ \frac{2\pi}{3} + C = 1 \Rightarrow C = 1 - \frac{2\pi}{3}, \text{ so } f(x) = 4 \sin^{-1} x + 1 - \frac{2\pi}{3}.$$

$$28. f''(t) = 2e^t + 3 \sin t \Rightarrow f'(t) = 2e^t - 3 \cos t + C \Rightarrow f(t) = 2e^t - 3 \sin t + Ct + D. f(0) = 2 + D \text{ and } \\ f(0) = 0 \Rightarrow D = -2. f(\pi) = 2e^\pi + \pi C - 2 \text{ and } f(\pi) = 0 \Rightarrow \pi C = 2 - 2e^\pi \Rightarrow C = \frac{2 - 2e^\pi}{\pi}, \text{ so } \\ f(t) = 2e^t - 3 \sin t + \frac{2 - 2e^\pi}{\pi}t - 2.$$

$$29. \text{ Given } f'(x) = 2x + 1, \text{ we have } f(x) = x^2 + x + C. \text{ Since } f \text{ passes through } (1, 6), f(1) = 6 \Rightarrow 1^2 + 1 + C = 6 \Rightarrow \\ C = 4. \text{ Therefore, } f(x) = x^2 + x + 4 \text{ and } f(2) = 2^2 + 2 + 4 = 10.$$

31.



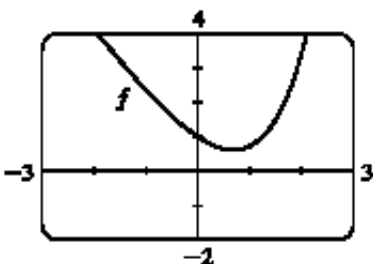
$$f'(x) = \begin{cases} 2 & \text{if } 0 \leq x < 1 \\ 1 & \text{if } 1 < x < 2 \\ -1 & \text{if } 2 < x \leq 3 \end{cases} \Rightarrow f(x) = \begin{cases} 2x + C & \text{if } 0 \leq x < 1 \\ x + D & \text{if } 1 < x < 2 \\ -x + E & \text{if } 2 < x \leq 3 \end{cases}$$

$f(0) = -1 \Rightarrow 2(0) + C = -1 \Rightarrow C = -1$ . Starting at the point  $(0, -1)$  and moving to the right on a line with slope 2 gets us to the point  $(1, 1)$ . The slope for  $1 < x < 2$  is 1, so we get to the point  $(2, 2)$ . Here we have used the fact that  $f$  is continuous. We can include the point  $x = 1$  on either the first or the second part of  $f$ . The line connecting  $(1, 1)$  to  $(2, 2)$  is  $y = x$ , so  $D = 0$ . The slope for  $2 < x \leq 3$  is  $-1$ , so we get to  $(3, 1)$ .  $f(3) = 1 \Rightarrow -3 + E = 1 \Rightarrow E = 4$ . Thus,

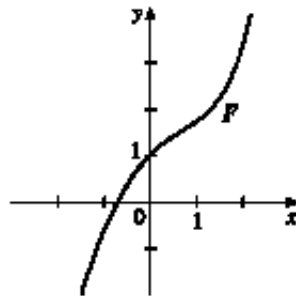
$$f(x) = \begin{cases} 2x - 1 & \text{if } 0 \leq x \leq 1 \\ x & \text{if } 1 < x < 2 \\ -x + 4 & \text{if } 2 \leq x \leq 3 \end{cases}$$

Note that  $f'(x)$  does not exist at  $x = 1$  or at  $x = 2$ .

32. (a)



(b)

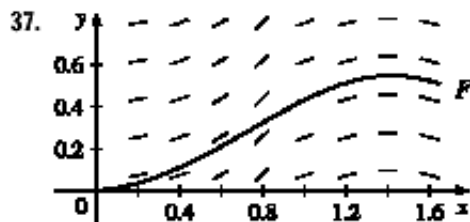
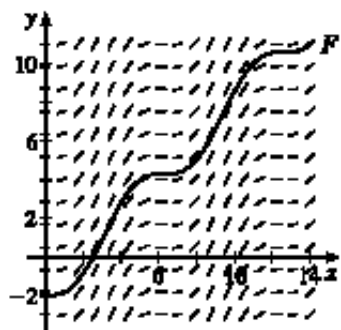


Since  $f$  is always positive,  $F$  is always increasing.

(c)  $f(x) = e^x - 2x \Rightarrow F(x) = e^x - x^2 + C$ .  $F(0) = 1 \Rightarrow 1 - 0 + C = 1 \Rightarrow C = 0$ ,  
so  $F(x) = e^x - x^2$ .

(d) If we use a graphing device to graph  $F(x) = e^x - x^2$ , we see that the graph looks similar to the one in part (b).

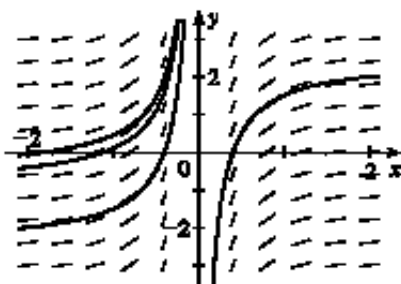
34.



Remember that the given table values of  $f$  are the slopes of  $F$  at any  $x$ .

For example, at  $x = 1.4$ , the slope of  $F$  is  $f(1.4) = 0$ .

38. (a)



(b) The general antiderivative of  $f(x) = x^{-2}$  is

$$F(x) = \begin{cases} -1/x + C_1 & \text{if } x < 0 \\ -1/x + C_2 & \text{if } x > 0 \end{cases} \quad \text{since } f(x) \text{ is not defined at } x = 0.$$

The graph of the general antiderivatives of  $f(x)$  looks like the graph in part (a), as expected.

41. (a) We first observe that since the stone is dropped 450 m above the ground,  $v(0) = 0$  and  $s(0) = 450$ .

$$v'(t) = a(t) = -9.8 \Rightarrow v(t) = -9.8t + C. \text{ Now } v(0) = 0 \Rightarrow C = 0, \text{ so } v(t) = -9.8t \Rightarrow$$

$$s(t) = -4.9t^2 + D. \text{ Last, } s(0) = 450 \Rightarrow D = 450 \Rightarrow s(t) = 450 - 4.9t^2.$$

(b) The stone reaches the ground when  $s(t) = 0$ .  $450 - 4.9t^2 = 0 \Rightarrow t^2 = 450/4.9 \Rightarrow t_1 = \sqrt{450/4.9} \approx 9.58$  s.

(c) The velocity with which the stone strikes the ground is  $v(t_1) = -9.8\sqrt{450/4.9} \approx -93.9$  m/s.

(d) This is just reworking parts (a) and (b) with  $v(0) = -5$ . Using  $v(t) = -9.8t + C$ ,  $v(0) = -5 \Rightarrow 0 + C = -5 \Rightarrow$

$$v(t) = -9.8t - 5. \text{ So } s(t) = -4.9t^2 - 5t + D \text{ and } s(0) = 450 \Rightarrow D = 450 \Rightarrow s(t) = -4.9t^2 - 5t + 450.$$

$$\text{Solving } s(t) = 0 \text{ by using the quadratic formula gives us } t = (5 \pm \sqrt{8845})/(-9.8) \Rightarrow t_1 \approx 9.09 \text{ s.}$$