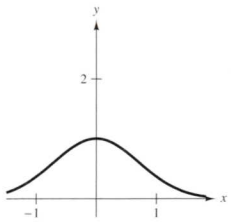
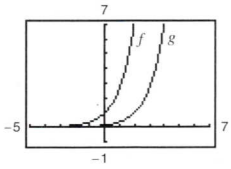
21.

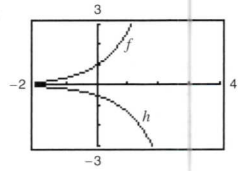


23. (a)



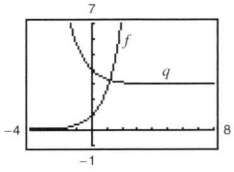
Translation two units to the right

(b)



Reflection in the x-axis and a vertical shrink

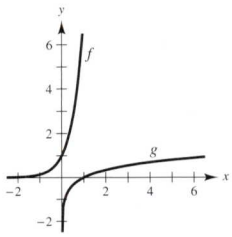
(c)



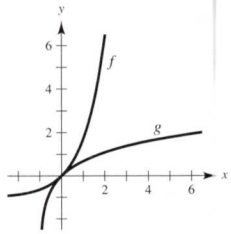
Reflection in the y-axis and a translation three units upward

25. c **26.** d **27.** a **28.** b

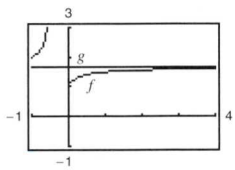
29.



31.



33.



$\lim_{x\to\infty} f(x) = \lim_{x\to\infty} g(x) = e^{0.5}$

35. $2.7182805 < e$ **37.** (a) $y = 3x + 1$ (b) $y = -3x + 1$

39. $2e^{2x}$ **41.** $e^{\sqrt{x}}/(2\sqrt{x})$ **43.** e^{x-4} **45.** $e^x\left(\frac{1}{x} + \ln x\right)$

47. $e^x(x^3 + 3x^2)$ **49.** $3(e^{-t} + e^t)^2(e^t - e^{-t})$

51. $2e^{2x}/(1 + e^{2x})$ **53.** $-2(e^x - e^{-x})/(e^x + e^{-x})^2$

55. $-2e^x/(e^x - 1)^2$ **57.** $2e^x \cos x$ **59.** $\cos(x)/x$

61. $y = -x + 2$ **63.** $y = -4(x + 1)$ **65.** $y = ex$

67. $y = (1/e)x - 1/e$ **69.** $\dfrac{10 - e^y}{xe^y + 3}$

71. $y = (-e - 1)x + 1$ **73.** $3(6x + 5)e^{-3x}$

75. $y'' - y = 0$

$4e^{-x} - 4e^{-x} = 0$

77. $y'' - 2y' + 3y = 0$

$e^x\left[-\cos\sqrt{2}x - \sin\sqrt{2}x - 2\sqrt{2}\sin\sqrt{2}x + 2\sqrt{2}\cos\sqrt{2}x\right] -$
$2e^x\left[-\sqrt{2}\sin\sqrt{2}x + \sqrt{2}\cos\sqrt{2}x + \cos\sqrt{2}x + \sin\sqrt{2}x\right] +$
$3e^x\left[\cos\sqrt{2}x + \sin\sqrt{2}x\right] = 0$

$0 = 0$

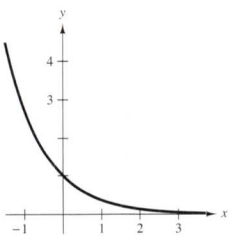
Section 5.4 (page 358)

1. $x = 4$ **3.** $x \approx 2.485$ **5.** $x = 0$ **7.** $x \approx 0.511$

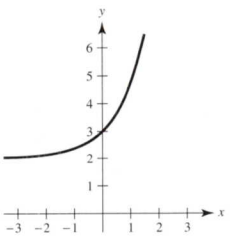
9. $x \approx 8.862$ **11.** $x \approx 7.389$ **13.** $x \approx 10.389$

15. $x \approx 5.389$

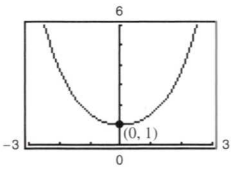
17.



19.

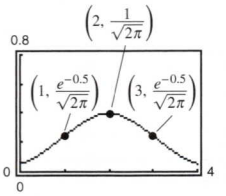


79. Relative minimum: $(0, 1)$

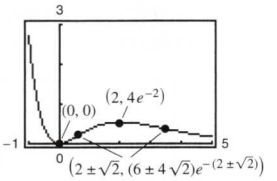


81. Relative maximum: $\left(2, 1/\sqrt{2\pi}\right)$

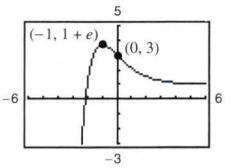
Points of inflection: $\left(1, \frac{e^{-0.5}}{\sqrt{2\pi}}\right), \left(3, \frac{e^{-0.5}}{\sqrt{2\pi}}\right)$



83. Relative minimum: $(0, 0)$
Relative maximum: $(2, 4e^{-2})$
Points of inflection: $\left(2 \pm \sqrt{2}, \left(6 \pm 4\sqrt{2}\right)e^{-(2 \pm \sqrt{2})}\right)$

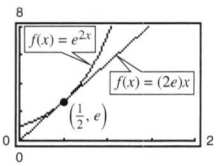


85. Relative maximum: $(-1, 1 + e)$
Point of inflection: $(0, 3)$

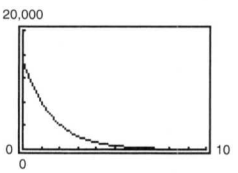


87. $A = \sqrt{2}e^{-1/2}$

89. $\left(\frac{1}{2}, e\right)$



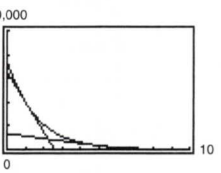
91. (a)



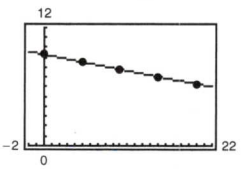
(b) When $t = 1$, $\frac{dV}{dt} \approx -5028.84$.

When $t = 5$, $\frac{dV}{dt} \approx -406.89$.

(c)



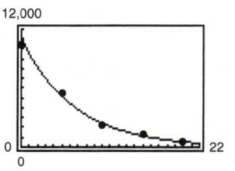
93. (a)



$\ln P = -0.1499h + 9.3018$

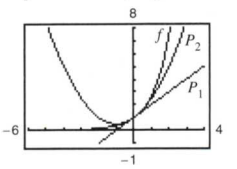
(b) $P = 10{,}957.7e^{-0.1499h}$

(c)



(d) $h = 5$: -776
$h = 18$: -111

95. $P_1 = 1 + x$; $P_2 = 1 + x + \frac{1}{2}x^2$



The values of f, P_1, and P_2 and their first derivatives agree at $x = 0$.

97. $12! = 479{,}001{,}600$
Stirling's Formula: $12! \approx 475{,}687{,}487$

99. $e^{5x} + C$ **101.** $\frac{1}{2}e^{2x-1} + C$ **103.** $\frac{1}{3}e^{x^3} + C$

105. $2e^{\sqrt{x}} + C$

107. $x - \ln(e^x + 1) + C_1$ or $-\ln(1 + e^{-x}) + C_2$

109. $-\frac{2}{3}(1 - e^x)^{3/2} + C$ **111.** $\ln|e^x - e^{-x}| + C$

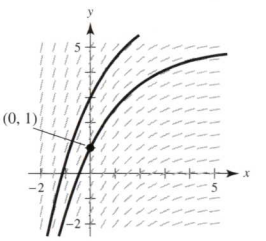
113. $-\frac{5}{2}e^{-2x} + e^{-x} + C$ **115.** $\ln|\cos e^{-x}| + C$

117. $(e^2 - 1)/(2e^2)$ **119.** $(e - 1)/(2e)$ **121.** $(e/3)(e^2 - 1)$

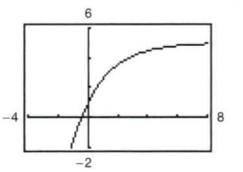
123. $\ln\left(\frac{1 + e^6}{2}\right)$ **125.** $(1/\pi)[e^{\sin(\pi^2/2)} - 1]$

127. $[1/(2a)]e^{ax^2} + C$ **129.** $f(x) = \frac{1}{2}(e^x + e^{-x})$

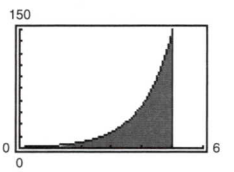
131. (a)



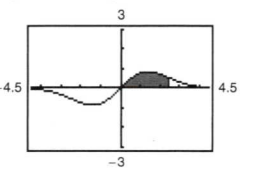
(b) $y = -4e^{-x/2} + 5$



133. $e^5 - 1 \approx 147.413$



135. $2(1 - e^{-3/2}) \approx 1.554$



137. Midpoint Rule: 92.190; Trapezoidal Rule: 93.837; Simpson's Rule: 92.7385

139. The probability that a given battery will last between 48 months and 60 months is approximately 47.72%.

141. (a) $t = \frac{1}{2k}\ln\frac{B}{A}$

(b) $x''(t) = k^2(Ae^{kt} + Be^{-kt})$, k^2 is the constant of proportionality.

143. $f(x) = e^x$

The domain of $f(x)$ is $(-\infty, \infty)$ and the range of $f(x)$ is $(0, \infty)$. $f(x)$ is continuous, increasing, one-to-one, and concave upward on its entire domain.

$\lim_{x \to -\infty} e^x = 0$ and $\lim_{x \to \infty} e^x = \infty$

145. (a) Log Rule (b) Substitution

147. $\int_0^x e^t\,dt \geq \int_0^x 1\,dt$; $e^x - 1 \geq x$; $e^x \geq x + 1$ for $x \geq 0$

149. $x \approx 0.567$ **151.** Proof