Practice the following problems related to the derivatives of exponential and logarithmic functions with natural base e.

## Section 2.2

Find the derivative of the following functions

**6.** $f(x) = x^5 - 2e^{6x}$

**6.** $5x^4 - 12e^{6x}$

**14.** $f(x) = e^{-x^2+7x}$

**14.** $(7 - 2x)e^{-x^2+7x}$

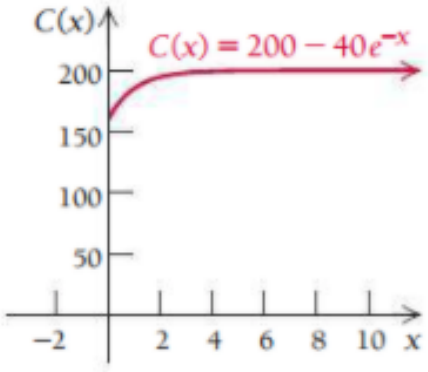
**18.** $y = xe^{-2x} + e^{-x} + x^3$

**18.** $-2xe^{-2x} + e^{-2x} - e^{-x} + 3x^2$

**48. Marginal cost.** The total cost, in millions of dollars, for Marcotte Industries is given by

$$C(x) = 200 - 40e^{-x},$$

where $x$ is the time in years since the start-up date.




Find each of the following.

**a)** The marginal cost $C'(x)$
**b)** $C'(1)$
**c)** $C'(5)$ (Round to the nearest thousand.)
**d)** Find $\lim_{x\to\infty} C(x)$ and $\lim_{x\to\infty} C'(x)$.

**48. (a)** $dC/dx = 40e^{-x}$; **(b)** \$14.715 million/yr; **(c)** \$270,000/yr; **(d)** 200 and 0

**52. Stock prices.** The value (price) of a share of stock in Barrington Gold was \$90 on June 15, 2018, and its value $t$ weeks after that date is given by

$$V(t) = 90e^{0.0296t}.$$

**a)** What was the rate of change in the value of a share of the stock on June 15, 2018?

**b)** Use the model to estimate the value of a share of the stock 6 weeks prior to June 15, 2018.

**52. (a)** \$2.66/week; **(b)** \$75.35

## Section 2.3

Find the derivative of the following functions

**4.** $f(x) = \ln(6x)$ Hint: chain rule!

**4.** $\frac{1}{x}$

**8.** $y = x^4 \ln x$

**8.** $x^3(1 + 4\ln x)$

**22.** Find the equation of the line tangent to the graph of $y = \ln(4x^2 - 7)$ at $x = 2$.

**22.** $y = 1.778x - 1.358$

**28. Marginal profit.** The profit, in thousands of dollars, from the sale of $x$ thousand candles can be estimated by

$$P(x) = 2x - 0.3x \ln x.$$

**a)** Find the marginal profit, $P'(x)$.
**b)** Find $P'(150)$, and explain what this number represents.
**c)** How many candles (in thousands) should be sold in order to achieve a marginal profit of \$750 per thousand candles?

**28. (a)** $P'(x) = 1.7 - 0.3 \ln x$; **(b)** 0.197, which means that, when 150,000 candles are sold, profit is increasing by about 0.197 thousand dollars (\$197) per unit; **(c)** about 23,700 units