

## Answer Key to Week #5 Assignment

### Problem 1.

Find the derivative of the following exponential function of x.

$$y = e^7 - 10x$$

Answers \*

☐

$$e^{-10}$$

☒

$$-10e^7 - 10x$$

☐

$$-10 \ln(7 - 10x)$$

☐

$$7e^7 - 10x$$

### Problem 2.

Find the derivative of the following function of x.

$$y = 8xe^x - 8e^x$$

Answers \*

☐

$$8e^x$$

☒

$$8xe^x$$

☐

$$8x$$

☐

$$8xe^x + 16e^x$$

**Problem 3.**

Find the derivative of the following function of  $x$ .

$$y = (x^2 - 2x + 4) e^x$$

Answers \*

☐

$$(x^2 + 4x + 2) e^x$$

☒

$$(x^2 + 2) e^x$$

☐

$$(2x - 2) e^x$$

☐

$$\left( \frac{x^3}{3} + 2x + 4 \right) e^x$$

**Problem 4.**

Find the derivative of the following function.

$$y = \ln (x - 3)$$

Answers \*

☐

$$\frac{1}{3 - x}$$

☒

$$\frac{1}{x - 3}$$

☐

$$\frac{1}{x + 3}$$

☐

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

**Problem 5.**

Find the derivative of the following function.

$$y = \frac{\ln x}{x^6}$$

Answers \*

☐

$$\frac{1 - 6\ln x}{x^{12}}$$

☐

$$\frac{1 + 6\ln x}{x^{12}}$$

☐

$$\frac{6\ln x - 1}{x^7}$$

☒

$$\frac{1 - 6\ln x}{x^7}$$

**Problem 6.**

Find the derivative of the function.

$$y = \ln 9x^2$$

Answers \*

☐

$$\frac{1}{2x + 9}$$

☒

$$\frac{2}{x}$$

☐

$$\frac{18}{x}$$

**Problem 7.**

Find the derivative of the function.

$$y = \ln \frac{1-x}{(x+5)^3}$$

Answers \*



$$\frac{2x-8}{(x+5)(1-x)}$$



$$\frac{(x+5)^3}{1-x}$$



$$\frac{2x-8}{(x+5)^4}$$

**Problem 8.**

Find the derivative of the function.

$$y = \ln \frac{1+\sqrt{x}}{x^5}$$

Answers \*



$$\frac{10-9\sqrt{x}}{2x(1+\sqrt{x})}$$



$$\frac{-10-9\sqrt{x}}{2(1+\sqrt{x})}$$



$$\frac{-10-9\sqrt{x}}{2x(1+\sqrt{x})}$$

### Problem 9.

Find the derivative of the function of

$$\theta$$

.

$$y = \ln(10\theta e^{-\theta})$$

Answers \*



$$\frac{1}{\theta} - 1$$



$$\frac{1}{10\theta e^{\theta}}$$



$$e^{\theta} \left( \frac{1}{\theta} + 1 \right)$$



$$\ln(10e^{-\theta}(1-\theta))$$

### Problem 10.

Find the derivative of

$$y = \ln(x^2)$$

Answers \*



$$\frac{2}{x}$$



$$\frac{1}{x^2}$$



$$2 + \frac{1}{x}$$



$$\frac{1}{2x}$$

**Problem 11.**

Find the derivative of

$$y = \ln\left(\frac{1}{x}\right)$$

Answers \*

☐

$$x$$

☒

$$-x$$

☐

$$1 - x$$

☐

$$1 - \frac{1}{x}$$

**Problem 12.**

Find the derivative of

$$y = x^e + e^x$$

Answers \*

☐

$$x^e + e^x$$

☐

$$ex^{e-1} + xe^{x-1}$$

☐

$$x^e + xe^{x-1}$$

☒

$$ex^{e-1} + e^x$$

### Problem 13.

It is reasonable for a manufacturer to expect the daily output of a new worker to be low at first, increase over time, and then level off. A manufacturer of LED flashlights determines that after  $t$  workdays, the number of flashlights produced per day by the average worker can be modeled by

$$N(t) = 80 - 70e^{-0.1t}$$

Find the derivative of  $N(t)$ .

Answers \*

☐

$$-70e^{-0.1t}$$

☒

$$7e^{-0.1t}$$

☐

$$-0.7e^{-0.1t}$$

☐

$$7te^{-0.1t}$$

### Problem 14.

**Marginal cost.** The total cost, in millions of dollars, for Greenleaf Construction is given by

$$C(x) = 100 - 50e^{-x}$$

where  $x$  is the number of houses built. Find the **marginal cost function** (i.e., the derivative of  $C(x)$ ).

Answers \*

☒

$$50e^{-x}$$

☐

$$50xe^{-x}$$

☐

$$50xe^{-x-1}$$

☐

$$-50e^{-x}$$

**Problem 15.**

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

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

Find the marginal profit function. (Hint: the marginal profit is the derivative of the profit function)

Answers \*



$$P'(x) = 1.7 - 0.3 \ln x$$



$$P'(x) = 1.7$$



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



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