Answer Key to Week #6 Assignment

Problem 1.

Find the derivative of the function of x:

$y = 10^x$

Answers *

- $x \ln 10$
- $10^x \ln x$
- 10^x
- ✓ $10^x \ln 10$

Problem 2.

Find the derivative of the following function:

$y = t^5 - e$

Answers *

- $t^5 - e$
- $(4 - e)t^5 - e$
- ✓ $(5 - e)t^4 - e$

Problem 3.

Find the derivative of the following function:

$$y = 2^{\ln(6t)}$$

Answers *

- $2^{\ln 6t}$
- ✓ $\frac{\ln 2}{t} 2^{\ln 6t}$
- $\frac{6 \ln 2}{t}$
- $\frac{6 \ln 2}{t} 2^{\ln 6t}$

Problem 4.

Find the derivative of the following function:

$y = 3^{\sqrt{t}}$

Answers *

- $3^{\sqrt{t}} \ln 3$
- $\frac{\ln 3^{\sqrt{t}}}{2\sqrt{t}}$
- $\frac{1}{2\sqrt{t}} 3^{\sqrt{t}}$
- ✓ $\frac{\ln 3}{2\sqrt{t}} 3^{\sqrt{t}}$

Problem 5.

Find the derivative of the following function:

$$y = \log_4\left(\frac{x^2}{6\sqrt{x+1}}\right)$$

[Hint: simplify the expression before taking the derivative]

Answers *

- $\frac{1}{\ln 4}\left(\frac{2}{x^2} - \frac{1}{2\sqrt{x+1}}\right)$
- $e^4\left(\frac{6\sqrt{x+1}}{x^2}\right)$
- ✓ $\frac{1}{\ln 4}\left(\frac{2}{x} - \frac{1}{2(x+1)}\right)$
- $\frac{1}{\ln 4}\left(\frac{6\sqrt{x+1}}{x^2}\right)$

Problem 6.

Find the derivative of the following function.

$$y = (\pi + 3)^x$$

Answers *

- $\pi + \ln(3)3^x$
- $\ln(x)(\pi + 3)^x$
- $x(\pi + 3)^{x-1}$
- ✓ $(\pi + 3)^x \ln(\pi + 3)$

Problem 7.

Find the derivative of the following function:

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

Answers *

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

Problem 8.

Use logarithmic differentiation to find the derivative of the following function.

$$y = a^{\ln x}$$

Answers *

- $\frac{a^{\ln(x)}}{x}$
- ✓ $\frac{a^{\ln(x)} \ln(a)}{x}$
- $(\ln(x) - 1)a^{\ln(x)}$
- x^{lna}

Problem 9.

Use logarithmic differentiation to find the derivative of y with respect to the independent variable.

$$y = a^{6x+9}$$

$$\text{for} \quad a > 0 \quad \text{and} \quad a \neq 1.$$

Answers *

- $(6x+8)a^{6x+9}$
- ✓ $6\ln(a)a^{6x+9}$
- $(6x+9)\ln(a)$

Problem 10.

Find the derivative of y.

$$y = 9e^{x^2}$$

Answers *

- $9x^2e^{x^2-1}$
- ✓ $18xe^{x^2}$
- $\ln(9)e^{x^2} + 9xe^{x^2-1}$
- $9e^{x^2}$

Problem 11.

Recycling glass. In 2012, 34.1% of all glass containers were recycled. A beverage company used 400,000 lb of glass containers per year. After recycling, the amount of glass, in pounds, still in use after t years is given by

$N(t) = 400000(0.341)^t$

Find $N'(t)$

Note that ln(0.341) = -1.075873.

Answers *

- ✓ $-430349.2(0.341)^t$
- $430349.2(0.341)^t$
- $-430349.2(0.651)^t$
- $400000t(0.341)^{t-1}$

Problem 12.

Agriculture. Farmers wishing to avoid the use of nonheirloom seeds are increasingly concerned about inadvertently growing nonheirloom plants as a result of pollen drifting from nearby farms. Assuming that these farmers raise their own seeds, the fractional portion of their crop that remains free of nonheirloom plants t years later can be approximated by

$P(t) = 1.1(0.985)^t$

Find $P'(t)$.

Answers *

- $1.1t(0.985)^t$
- $1.0835(0.985)^t$
- ✓ $-0.016625(0.985)^t$
- $1.1(0.985)^t$

Problem 13.

Irma invested $15,000 in a high-yield hedge fund, and after 14 years $A(t)$, her original investment has tripled. The exponential functions using base 3 and base e that give the value A of her account after t years is given by

$A(t) = 15000 \times 3^{t/14}$

Find $A'(t)$.

Answers *

- ✓ $\frac{15000\ln(3)}{14}3^{t/14}$
- $15000\ln(3)3^{t/14}$
- $\frac{15000}{14}3^{t/14}$
- $\frac{15000t}{14}3^{t/14}$

Problem 14.

Find the derivative of

$$y = e^x \log_5(2x+1)$$

Answers *

- $e^x \log_5(2x+1) + \frac{e^x}{2x+1}$
- $\frac{2e^x}{(2x+1)\ln(5)}$
- ✓ $e^x \log_5(2x+1) + \frac{2e^x}{(2x+1)\ln(5)}$
- $xe^{x-1}\log_5(2x+1) + \frac{\log(5)e^x}{2x+1}$