Derivatives of Exponential Functions P-Set

Find the derivative, $\frac{dy}{dx}$, of each.

1. $y = 7e^x$
2. $y = 2x(4 + e^x)$
3. $y = \frac{10}{5-e^x}$
4. $y = 4x^2e^x$
5. $y = \sqrt{12 - e^x}$
6. $y = e^{2x-1}$
7. $y = e^{\sqrt{x}}$
8. $y = e^{\ln(x)}$
9. $y = 5x \cdot e^{2x}$
10. $y = \ln\left(x^2 + e^{-x}\right)$

A veterinarian finds that when a lab animal specimen is exposed to a new pesticide, the growth of a tumor in the specimen can be modeled by

$$f(t) = 2.1e^{0.2t} \quad t > 0$$

where t is the number of days since exposure to the pesticide and $f(t)$ represents the diameter of the tumor in mm.

11. Determine $f'(t)$
12. Evaluate and interpret $f'(3)$

The derivative of a general exponential function in the form

$$f(x) = b^x$$

where $b > 0$ and $b \neq 1$ is

$$f'(x) = b^x \cdot \ln(b)$$

Use this to find the derivatives of the following functions.

13. $f(x) = 2^x$
14. $g(x) = \left(\frac{1}{3}\right)^x$
15. $y = 10^x$

. . . . . .

Key

1. $7e^x$
2. $2xe^x + 2e^x + 8$
3. $\frac{10e^x}{(5-e^x)^2}$
4. $8xe^x + 4x^2e^x$
5. $-\frac{e^x}{2\sqrt{12-e^x}}$
6. $2e^{2x-1}$
7. $\frac{e^{\sqrt{x}}}{2\sqrt{x}}$
8. 1
9. $5e^{2x} + 10xe^{2x}$
10. $\frac{2x-e^{-x}}{x^2+e^{-x}}$
11. $f'(t) = 0.42e^{0.2t}$
12. $f'(3) \approx 0.765$; three days after exposure, the tumor diameter is growing at a rate of about 0.765 mm/day.
13. $2^x \cdot \ln(2)$
14. $\left(\frac{1}{3}\right)^x \cdot \ln\left(\frac{1}{3}\right)$
15. $10^x \cdot \ln(10)$