Exponential Derivatives Worksheet

Name _____

February 20, 2007

1. Find the derivatives of the given functions.

   (a) $y = 5^x + 2$

   Solution. $y' = (\ln 5)5^x$ □

   (b) $y = 5t^2 + 4e^t$

   Solution. $y' = 10t + 4e^t$ □

   (c) $f(x) = 12e^x + 11^x$

   Solution. $f'(x) = 12e^x + (\ln 11)11^x$ □

   (d) $y = 3x - 2 \cdot 4^x$

   Solution. $y' = 3 - 2(\ln 4)4^x$ □

   (e) $y = \frac{3^x}{3} + \frac{33}{\sqrt{x}}$

   Solution. y may be rewritten as $y = \frac{3^x}{3} + 33x^{(-1/2)}$.
   $y' = \frac{(\ln 3)3^x}{3} - \frac{33}{2x^{3/2}}$ □

   (f) $f(t) = (\ln 3)^t$

   Solution. $f'(t) = (\ln(\ln 3))(\ln 3)^t$ □

   (g) $y = 5 \cdot 5^x + 6 \cdot 6^x$

   Solution. $y' = 5(\ln 5)5^x + 6(\ln 6)6^x$ □

   (h) $f(x) = e^k + k^x$

   Solution. $f'(x) = (\ln k)k^x$ □

   (i) $f(x) = e^{1+x}$

   Solution. $f(x)$ may be rewritten as $f(x) = e(e^x)$.
   $f'(x) = e(e^x) = e^{x+1}$ □

   (j) $y = \pi^2 + \pi^x$

   Solution. $y' = (\ln \pi)\pi^x$ □

2. Find the equation of the tangent line to $f(x) = 3^x$ at the point where $x = 2$.

Solution.

$$f'(x) = (\ln 3)3^x$$

The tangent line has slope $m = f'(2) = 9 \ln 3$. A point on the tangent line is $(2, f(2)) = (2, 9)$. Using the point-slope form of a line, we get

$$y - 9 = 9 \ln 3(x - 2).$$

That is, the equation of a tangent line to $f(x)$ at the point $x = 2$ is $y = (9 \ln 3)x - 18 \ln 3 + 9$. □