

**AP Calculus BC**

Lesson 7.2 day 2

1. [1993AB2] NO CALCULATOR

A particle moves on the x-axis so that its position at any time  $t \geq 0$  is given by  $x(t) = 2te^{-t}$ .

a. Find the acceleration of the particle at  $t = 0$ .

b. Find the velocity of the particle when its acceleration is 0.

c. Find the total distance traveled by the particle from  $t = 0$  to  $t = 5$ .

2. Find the derivative  $\frac{dy}{dx}$  of each of the following functions:

a.  $y = e^{\tan x}$

b.  $y = 2^{x^2}$

c.  $y = 2^{3\log_2 x}$

3. Find an antiderivative for each of the following functions:

a.  $f(x) = e^x + x^e + e$

b.  $g(x) = 2 \cdot 3^{x-1}$

c.  $h(x) = x^{\ln(5)}$

4. Use the relationship between the slopes on a function and its inverse to find  $\frac{d(f^{-1}(x))}{dx}$ , if  $f(x) = \sqrt{x}$ .
5. Compare the graphs of  $y = e^x$  and  $y = a^x$ . What transformation can be applied to the first function to create the second function? What implications does this have for the relationship between the derivatives of the functions?
6. Compare the graphs of  $y = \ln x$  and  $y = \log_b x$ . What transformation can be applied to the first function to create the second function? What implications does this have for the relationship between the derivatives of the functions?
7. Rewrite the following functions as exponential functions with constant bases:
- $f(x) = x^x$
  - $f(x) = x^{\sin x}$
8. A rectangle has its base on the x-axis, a vertex on the y-axis, and a vertex on the curve  $y = e^{-x^2}$ . What choice of vertex gives the largest possible area for the rectangle? Show that this value is the inflection point of the curve.

9. Evaluate each of the following without using your calculator:

a.  $\log_3 9$

b.  $\log_5 \frac{1}{25}$

c.  $\log_{25} 5$

d.  $\ln \sqrt[3]{e}$

e.  $\log_6 3 + \log_6 12$

f.  $\log_4 8 - \log_4 2$

10. Suppose that you invest \$1 at 100% interest for one year. Find the amount that your investment is worth if you compound the interest:

a. once a year

b. twice a year

c. monthly

d. weekly

e. daily

f. hourly

What is the limiting value on your investment?