AP Calculus Name_____

Natural Logs and E

Date_____ Period____

Differentiate each function with respect to *x*.

1) $f(x) = \cos 4x^4$

$$f'(x) = -\sin 4x^4 \cdot 16x^3$$
$$= -16x^3 \sin 4x^4$$

2) $y = \sec 2x^4$

$$\frac{dy}{dx} = \sec 2x^4 \cdot \tan 2x^4 \cdot 8x^3$$
$$= 8x^3 \sec 2x^4 \cdot \tan 2x^4$$

3) $y = \tan 5x^5$

$$\frac{dy}{dx} = \sec^2 5x^5 \cdot 25x^4$$
$$= 25x^4 \cdot \sec^2 5x^5$$

4) $y = \sec 4x^4$

$$\frac{dy}{dx} = \sec 4x^4 \cdot \tan 4x^4 \cdot 16x^3$$
$$= 16x^3 \sec 4x^4 \cdot \tan 4x^4$$

Differentiate each function with respect to the given variable.

5) $r = \ln 4s^4$

$$\frac{dr}{ds} = \frac{4}{s}$$

6) $r = e^{4s^4}$

$$\frac{dr}{ds} = 16s^3 e^{4s^4}$$

7) $h(t) = \ln t^5$

$h'(t) = \frac{5}{t}$

8) $f = e^{3r^2}(4r^5 - 5)$

$\frac{df}{dr} = 2re^{3r^2}(10r^3 + 12r^5 - 15)$

9) $f(r) = e^{3r^4}$

$f'(r) = 12r^3 e^{3r^4}$

10) $s = (4r^2 - 3)\ln 4r^5$

$\frac{ds}{dr} = \frac{8r^2 \ln 4r^5 + 20r^2 - 15}{r}$

11) $f = e^{4s^3}$

$\frac{df}{ds} = 12s^2 e^{4s^3}$

12) $g(r) = e^{5r^2}(2r^5 + 1)$

$g'(r) = 10re^{5r^2}(r^3 + 2r^5 + 1)$