

Name: Key

NO CALCULATORS

1. [5 points each] Compute each of the following derivatives.

a. $(\sec \ln x^2)'$

$$= \sec(\ln x^2) \tan(\ln x^2) \cdot (\ln x^2)'$$

$$= \frac{2 \sec(\ln x^2) \tan(\ln x^2)}{x} \quad \frac{2x}{x^2} = \frac{2}{x}$$

b. $(\cosh 3x^7)'$

$$= \sinh(3x^7) \cdot (3x^7)'$$

$$= 21x^6 \sinh(3x^7)$$

c. $((\tan x^2) \cdot e^{x^3})'$

$$= (\tan x^2)' e^{x^3} + (\tan x^2) \cdot (e^{x^3})'$$

$$= \sec^2(x^2) \cdot (x^2)' e^{x^3} + \tan(x^2) \cdot e^{x^3} (x^3)'$$

$$= 2x \sec^2(x^2) e^{x^3} + 3x^2 \tan(x^2) e^{x^3}$$

d. $(\sin^{-1} t^3)'$

$$= \frac{1}{\sqrt{1-(t^3)^2}} (t^3)'$$

$$= \frac{3t^2}{\sqrt{1-t^6}} \quad \text{not } t^3!$$

e. $(\tan^{-1} 4^x)'$

$$= \frac{1}{1+(4^x)^2} (4^x)' = \frac{4^x \ln 4}{1+4^{2x}}$$

f. Let $y = x^x$. Find $\frac{dy}{dx}$.

$\ln y = x \ln x$

Apply $\frac{d}{dx}$ to both sides.

$$\frac{y'}{y} = \ln x + \frac{x}{x}$$

$$y' = y (\ln x + 1)$$

$$y' = x^x (\ln x + 1)$$