

## Solutions to Practice Problems Set 2 for the Derivative Gateway Test - Spring, 2003

Find the derivatives of the following functions:

1.  $y = \cos\left(\frac{2x+1}{x^2+9}\right)$

$$\frac{dy}{dx} = -\sin\left(\frac{2x+1}{x^2+9}\right) \left( \frac{2(x^2+9) - (2x+1)(2x)}{(x^2+9)^2} \right) = -\sin\left(\frac{2x+1}{x^2+9}\right) \left( \frac{18-2x-2x^2}{(x^2+9)^2} \right)$$

2.  $f(x) = \arctan(\sin x)$

$$f'(x) = \frac{1}{1+\sin^2 x} \cos x = \frac{\cos x}{1+\sin^2 x}$$

3.  $g(y) = \frac{y^2+16}{\pi} + \frac{e}{y^3}$

$$g'(y) = \frac{1}{\pi}(2y) + e(-3y^{-4}) = \frac{2y}{\pi} - \frac{3e}{y^4}$$

4.  $z = \frac{e^{t^2}}{t^2+25}$

$$\frac{dz}{dt} = \frac{2te^{t^2}(t^2+5) + e^{t^2}(2t)}{(t^2+25)^2} = \frac{2te^{t^2}(t^2+6)}{(t^2+25)^2}$$

5.  $w = \ln(1 + \sec^2 x)$

$$\frac{dw}{dx} = \frac{1}{1+\sec^2 x} (2 \sec x \sec x \tan x) = \frac{2 \sec^2 x \tan x}{1+\sec^2 x}$$

6.  $h(x) = \tan^5(3x+7)$

$$h'(x) = 5 \tan^4(3x+7) \sec^2(3x+7)(3) = 15 \tan^4(3x+7) \sec^2(3x+7)$$

7.  $u = \sqrt{1 + \arcsin x}$

$$\frac{du}{dx} = \frac{1}{2}(1 + \arcsin x)^{-1/2} \frac{1}{\sqrt{1-x^2}} = \frac{1}{2\sqrt{1 + \arcsin x} \sqrt{1-x^2}}$$

8.  $K = \sec \sqrt{u^2+1}$

$$\frac{dK}{du} = \sec \sqrt{u^2+1} \tan \sqrt{u^2+1} \frac{1}{2\sqrt{u^2+1}} (2u) = \frac{u}{\sqrt{u^2+1}} \sec \sqrt{u^2+1} \tan \sqrt{u^2+1}$$

9.  $y = \cos^2 t + \sin^2 t$

$$y = 1, \frac{dy}{dt} = 0$$

**10.**  $y = e^{e^t}$

$$\frac{dy}{dt} = e^{e^t} e^t$$