Math 142
Spring, 2005 Name: **Solutions**
Quiz 12 - §§P.4, 2.8

Complete the following problems. Show all work to receive full credit.

1. Find $\frac{d}{dx}\left(\csc^{-1}(x^2+1)\right)$

$$= -\frac{1}{\mid x^2+1 \mid \sqrt{(x^2-1)^2-1}} \cdot 2x$$
$$= -\frac{2x}{\mid x^2+1 \mid \sqrt{x^4-2x^2+1-1}}$$
$$= -\frac{2x}{\mid x^2+1 \mid \sqrt{x^4-2x^2}}$$

2. Find $\frac{d}{dt}\left(\sin^{-1}\sqrt{2}t\right)$

$$= \frac{1}{\sqrt{1-(\sqrt{2}t)^2}} \cdot \sqrt{2} = \frac{\sqrt{2}}{\sqrt{1-2t^2}}$$

3. Find $\frac{d}{dx}\left(\tan^{-1}\sqrt{x^2-1} + x\sin^{-1}x\right)$

$$= \frac{1}{1+(\sqrt{x^2-1})^2} \cdot \frac{1}{2}(x^2-1)^{-\frac{1}{2}} \cdot 2x + \sin^{-1}x + x\frac{1}{\sqrt{1-x^2}}$$
$$= \frac{x}{(1+x^2-1)\sqrt{x^2-1}} + \sin^{-1}x + x\frac{1}{\sqrt{1-x^2}}$$
$$= \frac{x}{x^2\sqrt{x^2-1}} + \sin^{-1}x + x\frac{1}{\sqrt{1-x^2}}$$
$$= \frac{1}{x\sqrt{x^2-1}} + \sin^{-1}x + x\frac{1}{\sqrt{1-x^2}}$$

4. Find $\left(f^{-1}\right)'(x)$ at $x=1$ if $f(x)=x^3-3x^2+2x+1$.

$$f'(x) = 3x^2-6x+2$$
$$f^{-1}(1) = t \text{ means } f(t)=1$$

This is true when $t=0$ since $f(0)=0^3+3(0)^2+2(0)+1$ So, we have

$$\left(f^{-1}\right)'(1) = \frac{1}{f'(0)} = \frac{1}{3(0)^2-6(0)+2} = \frac{1}{2}$$