Math 142
Spring, 2006
Quiz 15 - §3.8

Name: **Solutions**

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

1. Find the following derivatives:

   (a) Find $\dfrac{d}{dt}\left(\sin^{-1}(\sqrt{2}\,t)\right)$

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

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

   (b) $\dfrac{d}{ds}\left(s\sqrt{1-s^2}+\cos^{-1}s\right)$

$$= \sqrt{1-s^2} + \frac{1}{2}\left(1-s^2\right)^{-\frac{1}{2}}(-2s)\cdot s - \frac{1}{\sqrt{1-s^2}}$$

$$= \sqrt{1-s^2} + \frac{-s^2}{\sqrt{1-s^2}} - \frac{1}{\sqrt{1-s^2}}$$

$$= \frac{1-s^2}{\sqrt{1-s^2}} - \frac{s^2}{\sqrt{1-s^2}} - \frac{1}{\sqrt{1-s^2}}$$

$$= \frac{1-s^2-s^2-1}{\sqrt{1-s^2}}$$

$$= \frac{-2s^2}{\sqrt{1-s^2}}$$

   (c) $\dfrac{d}{dx}\left(\ln(x^2+4) - x\tan^{-1}\left(\dfrac{x}{2}\right)\right)$

$$= \frac{1}{x^2+4}\cdot 2x - \left(\tan^{-1}\left(\frac{x}{2}\right) + \frac{1}{1+\left(\frac{x}{2}\right)^2}\cdot x\right)$$

$$= \frac{2x}{x^2+4} - \tan^{-1}\left(\frac{x}{2}\right) - \frac{1}{2}\frac{x}{1+\frac{x^2}{4}}$$

$$= \frac{2x}{x^2+4} - \tan^{-1}\left(\frac{x}{2}\right) - \frac{x}{\frac{4+x^2}{4}}\cdot\frac{1}{2}$$

$$= \frac{2x}{x^2+4} - \tan^{-1}\left(\frac{x}{2}\right) - \frac{2x}{4+x^2}$$

$$= -\tan^{-1}\left(\frac{x}{2}\right)$$