MTH 132 Quiz 2
Due June 2 at the beginning of class

Name: Solutions

1. (5 points) Prove that
\[
\frac{d}{dx} \csc x = -\csc x \cot x
\]

\[
\frac{d}{dx} \csc x = \frac{d}{dx} \frac{1}{\sin x} = -\csc x \cot x
\]

quotient rule

\[
\frac{d}{dx} 1 = 0 = -\frac{\cos x}{\sin x}
\]

\[
= -\frac{1}{\sin x} \cos x
\]

\[
= -\csc x \cot x
\]

2. (5 points) The position of a particle is given by
\[
s(t) = \sin^2(t) + 3
\]
for \(0 < t < \pi\).

(a) When does the particle have positive velocity?
(b) Is the acceleration at time \(t = \pi/2\) positive, negative, or zero?

2a) \(v(t) = s'(t) = 2\sin t \cos t\)

Since \(\sin t > 0\) for \(0 < t < \pi\) and \(\cos t > 0\), \(\pi/2 < t < \pi\), \(v\) is negative for \(\pi/2 < t < \pi\).

2b) \(a(t) = \frac{dv}{dt} \bigg|_{t=\pi/2} = 2\cos t \left(-\sin t\right) + 2\sin t \cos t \bigg|_{\pi/2}
\]

\[
= 2\cos^2\left(\frac{\pi}{2}\right) - 2\sin^2\left(\frac{\pi}{2}\right)
\]

\[
= -2 \quad \text{[Negative]}
\]