Sample

Math 31 Unit 3 ExamNameDerivatives of Trigonometric Functions Name _____

[marks] 1. Evaluate the following limits: $\sin^2 4x$

a)
$$\lim_{x \to 0} \frac{\sin^2 4x}{\sin^2 3x}$$

b)
$$\lim_{x \to \pi} \frac{\sin x}{\pi - x}$$

[6]



2. Find
$$\frac{dy}{dx}$$
 for $y = \frac{\sin x}{\cos^2 x}$

[3]

- 3. Differentiate y with respect to x.
- a) $y = x\cos(x^3 2)$

b) $5\tan(\sin\sqrt{x})$

[9]

c)
$$y = x^2 \cos^{-1}\left(\frac{x}{2}\right)$$

4. Using implicit differentiation, find $\frac{dy}{dx}$ when $y + 4 = \tan x + \sec y$

[3]

5. Find the **exact** value of each of the following, (use a diagram to show the relevant quantities):

a)
$$\tan\left(\sin^{-1}\frac{4}{5}\right)$$

$$\begin{bmatrix} 2 \end{bmatrix}$$

b) $\sin^{-1}\left(\cos\frac{\pi}{6}\right)$

6. Find the equation of the tangent line to $y = \cos x \tan\left(\frac{x}{2}\right)$ when $x = \frac{\pi}{2}$

[4]

7. At a 7:30 pm, a 20 m tall building casts a shadow of 40 m. At that time in the evening, the angle of elevation of the sun in decreasing by 0.30 rad/h, at what rate is the shadow of the building lengthening at that time?

[5]

8. A ladder 2.5 m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 0.25 m/s, how fast is the angle between the bottom of the ladders and the ground changing when the angle is $\frac{\pi}{3}$?

[5]