Name:________________________

Notesheet. Section 12.3: Differentiation of Trigonometric Functions

Math 1220

Theorem 1. We have the following derivatives.

(a) $\dfrac{d}{dx}\sin(x) =$

(b) $\dfrac{d}{dx}\cos(x) =$

Challenge 2. Using the quotient rule, what is $\dfrac{d}{dx}\tan(x)$?

Challenge 3. Using the chain rule, what is $\dfrac{d}{dx}\sec(x)$?

Theorem 4 (Trigonometric Derivatives)**.** We have the following derivatives.

- $\dfrac{d}{dx}\sin(x) =$
- $\dfrac{d}{dx}\cos(x) =$
- $\dfrac{d}{dx}\sec(x) =$
- $\dfrac{d}{dx}\csc(x) =$
- $\dfrac{d}{dx}\tan(x) =$
- $\dfrac{d}{dx}\cot(x) =$

Useful mnemonic: starts with 'c' $\iff$ the derivative has a minus sign.

Challenge 5. Find an equation of the tangent line of $f(x) = \sin(x^2)$ at $\left(\sqrt{\frac{\pi}{2}}, 1\right)$.

Challenge 6. A rocket is blasting off into space by launching vertically. Let $y(t)$ be a function indicating how high the rocket is at time t. $12,000$ feet away, a camera is setup to watch the rocket. Let θ be the angle between the line from the camera to the launch point and the line between the camera and the rocket. How fast is θ changing at the instant when

(a) the rocket is at a distance of $13,000$ feet from the camera and

(b) the distance is increasing at the rate of 480 feet/second?