

Math123 (Calculus I)
Handwritten Assignment 5

This assignment covers U2HW3.4, U2HW3.5, U2HW3.7, U2HW3.8 and U2HW3.9

Handwritten homework is not graded but meant to help you prepare for the exam. If you do not do the handwritten homework and review the solutions it will be difficult to pass the exams. Solutions will be posted on the Lecture Video page at ProfessorTrimble.com.

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Problem One (10 points)

Determine the following derivatives of $y = \frac{x^2 - 7x}{x + 1}$ and evaluate at the indicated values of x .

$$\left. \frac{dy}{dx} \right|_{x=2}$$

$$\left. \frac{d^2 y}{dx^2} \right|_{x=1}$$

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Problem Two (10 points)

Evaluate the following limits. You may need to rewrite or simplify to determine the limit. If you use the results of other known limits please note them separately and how they apply to the limits below.

$$\lim_{x \rightarrow 0} \frac{\sin(8x)}{2x}$$

$$\lim_{\theta \rightarrow 0} \frac{\sec(\theta) - 1}{\theta}$$

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Problem Three (10 points)

Determine the derivative of the function $y = \sec(\theta) \tan(\theta)$ and evaluate the derivative at $\theta = \frac{5\pi}{6}$.

Determine the derivative of the function $y = \frac{1 - \cos(\theta)}{1 + \cos(\theta)}$ and evaluate the derivative at $\theta = \frac{3\pi}{4}$.

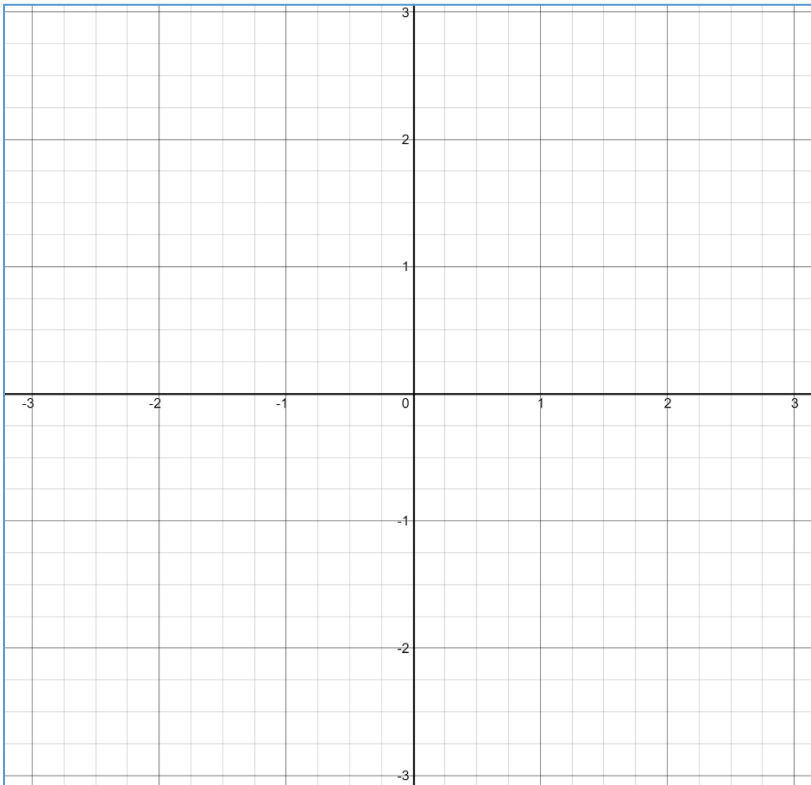
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Problem Four (10 points)

Determine equations of the lines tangent to the graph of $y = x\sqrt{5-x^2}$ at the points $(-2, -2)$. Carefully graph the function and the tangent line on the grid below.



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Problem Five (10 points)

Use implicit differentiation to find the equations (in point-slope form) of the tangent line **and** the normal line to the graph of $(xy + 1)^3 = x - y^2 + 8$ at the point $(1, 1)$. Be sure to label each equation.

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Problem Six (10 points)

Find the derivative of each function. Work goes below the blank and the simplified answer goes on the blank.

$$\frac{d}{dx} \sin\left(\frac{1}{x}\right) = \underline{\hspace{10em}} \qquad \frac{d}{dx} \cos(4x+3) = \underline{\hspace{10em}}$$

$$\frac{d}{dx} \tan(\sqrt{x}) = \underline{\hspace{10em}} \qquad \frac{d}{dx} \cot(3x^2) = \underline{\hspace{10em}}$$

$$\frac{d}{dx} \sec(5x) = \underline{\hspace{10em}} \qquad \frac{d}{dx} \csc\left(\frac{x}{4}\right) = \underline{\hspace{10em}}$$

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Problem Seven (10 points)

At what value(s) of x does the following function have a horizontal tangent line?

$$f(x) = \frac{3x^2 - 3x + 1}{5x^2 + x - 4}$$

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Problem Eight (10 points)

A rectangle initially has dimensions 8 cm by 3 cm. All sides begin increasing in length at a rate of 5 cm/sec. At what rate is the area of the rectangle increasing after 15 seconds?