

Math 20A (Shenk). Quiz 2. July 19, 2011.

Name _____

Work alone and use no books, notes, or calculators. Show your work with your answers on 8.5"×11" paper and staple the pages to the quiz when you turn them in.

Problem 1 The instantaneous rate of change of the angle x in the triangle in Figure 1 is $\frac{1}{10}$ radian per minute when the angle is $\frac{1}{2}$ radian. At what rate is the length h of the opposite side increasing or decreasing at that moment?

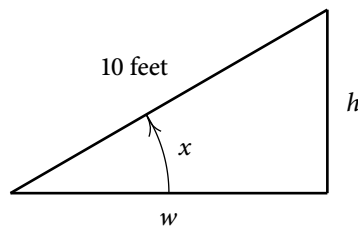


FIGURE 1

Problem 2 Of all right triangles with hypotenuse of length 10 as in Figure 1, which has the maximum perimeter? Justify your answer.

Problem 3 Find the derivatives (a) $\frac{d}{dx}(x^2 + e^x)$ and (b) $f'(e)$ for $f(x) = x \ln x$.

Problem 4 Give an equation of the tangent line to $y = \tan^{-1} x$ at $x = 1$.

Problem 5 The point P is moving on the x -axis and the point Q is moving on the y -axis in an xy -plane with distances measured in meters. When P is at $(5, 0)$, it is moving two meters per second in the positive x -direction, the point Q is at $(0, 12)$, and the distance between the points is increasing ten meters per second. How fast is Q moving at that moment and in what direction?

Problem 6 (a) Find the limits of $f(x) = x + \frac{4}{x}$ as $x \rightarrow -\infty$, as $x \rightarrow 0^-$, as $x \rightarrow 0^+$, and as $x \rightarrow \infty$.
(b) On which intervals is f increasing and decreasing?
(c) On which open intervals is the graph of f concave up and concave down?
(d) Does f have any local or global maxima or minima?
(e) Use the information from parts (a) through (d) to sketch the graph of f .

Problem 7 You can sell 100 coffee mugs at \$20 each. For every dollar you raise the price you lose 10 sales. How much should you charge to maximize your revenue from the mugs?

Problem 8 Find (a) $\lim_{x \rightarrow 0} \frac{1 - e^x}{\sin(3x)}$ and (b) $\lim_{x \rightarrow \pi} \frac{\ln x}{\cos x}$.