

MATH 1310-1 — Midterm 3 Fall 2022

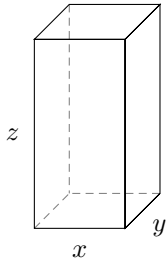
Name: _____ Unid: _____

Date: 11/18/2022

Instructor: William Nesse

No phones, calculators, or notes. Show all your work for full credit.

1. Consider a box with side lengths x , y , z , in which $x = y$ and $z = 2x$. The volume of the box is growing at a rate of 3 units-cubed per second. Calculate how fast the the z -length is increasing per second when $(x, y, z) = (2, 2, 4)$?

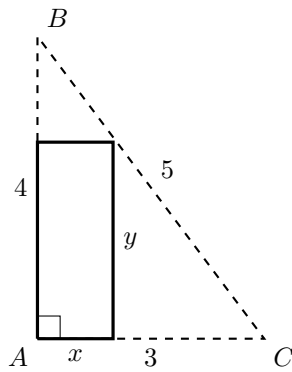


2. Identify the indeterminate forms and evaluate the following limits using l'Hospital's rule (LHR). Be sure to verify the hypotheses permitting LHR before it is used, and be sure to write all "lim" symbols at each juncture.

(a) $\lim_{x \rightarrow 1} \frac{\ln(x)}{x - 1}$

(b) $\lim_{x \rightarrow \infty} \left(\frac{x}{1 + x} \right)^x$

3. Consider a right triangle A-B-C with hypotenuse of length 5, and the other sides measuring 3 and 4. A rectangle with sides x and y is inscribed inside the triangle with a corner touching the hypotenuse at one point as shown in the figure. There are many such rectangles with width x and height y that fit inside the triangle. **Find the dimensions x and y of the particular rectangle that has maximum area.**



4. Consider the function $f(x) = \cos(x)$ on the interval $[-\pi/2, \pi/2]$. Setup an approximate Riemann sum with $n = 10$ points, uniformly spaced, using the left-endpoint rule, to estimate the area under the curve on the interval $[-\pi/2, \pi/2]$: that is determine $\sum_{i=1}^n (?)\Delta x$.
- (a) Specify x_i^* and $i = ?, \dots, ?$
 - (b) Specify $\Delta x = ?$.
 - (c) Compose all details of the approximate Riemann sum $\sum_{i=1}^n (?)\Delta x$.

Extra space—please indicate on the main page(s) if you utilize this space for your answers.