

# Math 1a – Quiz 9

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1. (2 points) Which one of the following limits CANNOT be evaluated using l'Hôpital's rule?

(a)  $\lim_{x \rightarrow 0} \frac{\cosh x - 1}{\sinh x}$

(b)  $\lim_{x \rightarrow 0^+} \sqrt{x} \ln x$

(c)  $\lim_{x \rightarrow \infty} e^x - x^2$

(d)  $\lim_{x \rightarrow -\infty} \frac{x^3}{3^x}$

(e)  $\lim_{x \rightarrow \infty} \left(1 - \frac{2}{x}\right)^x$

2. (3 points) Choose one of the limits above that CAN be evaluated using l'Hôpital's rule, and evaluate it.

3. (3 points) A rectangle has its base on the  $x$ -axis and its other two vertices above the  $x$ -axis and lying on the parabola  $y = 8 - x^2$ . What is the largest possible area of such a rectangle?

4. (7 points) Sketch a graph of  $f(x) = \ln(\cos x)$ . To aid in your drawing, answer all of the following:
- (a) What is the domain of  $f$ ? (Hint: think carefully about the domain and range of  $\ln x$  and  $\cos x$ .)
  - (b) What are the  $x$ - and  $y$ -intercepts of  $f$ ?
  - (c) When is  $f$  positive?
  - (d) Does  $f$  have any symmetry or periodicity?
  - (e) Does  $f$  have any vertical, horizontal, or slant asymptotes?
  - (f) On what intervals is  $f$  increasing/decreasing?
  - (g) Identify the local maxima and minima of  $f$  (if any).
  - (h) On what intervals is  $f$  concave up/down?
  - (i) Identify the inflection points of  $f$  (if any).