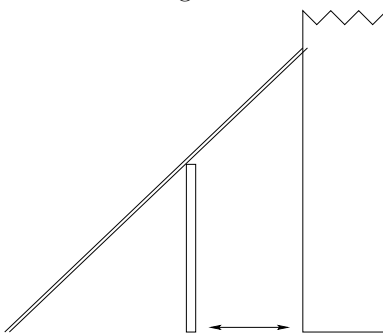


MATH 124 REVIEW PROBLEMS, AUTUMN 2007

NATHAN GRIGG

1. A fence 8 ft tall runs parallel to a tall building at a distance of 4 ft from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?



2. A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?

3. The x^y button on your calculator is broken, and you need to find out what $5^{0.99}$ is. Luckily, you can figure out 5^1 in your head and use tangent line approximation to get an approximate value for $5^{0.99}$. What do you get for your approximation?

4. Let

$$F(x) = \frac{x^2 - 1}{|x - 1|}.$$

Find $\lim_{x \rightarrow 1^+} F(x)$ and $\lim_{x \rightarrow 1^-} F(x)$ and say whether or not $\lim_{x \rightarrow 1} F(x)$ exists.

5. Find the derivative of x^x .

- 6.¹ Define a function $f(x)$ as follows:

$$f(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ 0 & \text{if } x \text{ is irrational} \end{cases}.$$

Use the squeeze theorem to show that $\lim_{x \rightarrow 0} f(x) = 0$.

¹NOTE: Problem 6 is on this review because some people wanted to practice a squeeze theorem problem. You should all know what the squeeze theorem is, and it is *possible* that there will be a squeeze theorem problem on the final, but spend most of your time studying the more important stuff in problems 1–5.)