118 PRACTICE MIDTERM #2

1. Find an equation for the tangent line to the ellipse $x^2 + xy + y^2 = 3$ at the point $(1, 1)$.

2. Use linear approximation to estimate $(2.001)^5$.

3. Suppose that $B(t)$ is the number of bananas that I eat on the tth day of the current year, and $C(b)$ is how much it costs to buy b bananas. On January 5 of this year, I ate 20 bananas, and that number was decreasing by 3 bananas per day. The price of a banana on January 5 was \$0.50. Calculate the following quantities on January 5 of this year, and write a sentence interpreting each value.

   (a) $B(5)$

   (b) $\dfrac{dB}{dt}$

   (c) $\dfrac{dC}{db}$

   (d) $\dfrac{dC}{dt}$

4. Bears have a lot of trouble finding comfortable furniture for their caves. To help them out, Claire has started her own company, Claire's Chairs for Bears' Lairs, Inc. Her fixed costs are \$5000, and each chair she manufactures costs her an additional \$10. In order to sell q chairs, she needs to set the price at \$$p$, where $p = -5q + 4000$.

   (a) Express the company's costs $C(q)$ as a function of the quantity sold q.

   (b) Express the company's revenue $R(q)$ as a function of the quantity sold q.

   (c) Express the company's profit $\pi(q)$ as a function of the quantity sold q.

   (d) How many chairs should Claire produce to earn the largest possible profit, and what is that profit?

   EXTRA CREDIT Use the chain rule to find $\dfrac{d}{d\theta}(\sin \theta°)$, where θ is in degrees.