MATH 170 – Section 006 – Quiz 6

You may work with other class members on this quiz, but you may not receive assistance from people not in your MATH 170 section. You must show all of your work to receive full credit. Do all your work on other sheets of paper and be sure to staple all the pieces of paper together or YOU WILL GET A ‘ZERO’ ON THE QUIZ. Do not use decimal approximations unless asked to do so. Your work on this quiz must be handed in by the beginning of class on Friday, 19 October 2007. GOOD LUCK!

1) A circular oil slick is growing at the rate of 1 square foot per minute. At what rate is its circumference changing when its diameter is 10 feet?

2) A girl flies a kite, letting out the string at the rate of 3 ft/sec. The kite flies horizontally at 200 feet above the ground. At what rate is the angle between the kite string and the horizontal changing when 400 feet of string have been let out?

3) Use linearization to estimate \( \sqrt{99} \). Without using a calculator, determine whether your estimate is greater than or less than the exact value of \( \sqrt{99} \) and explain your reasoning.

4) Prove:
\[
\text{arcsinh } t = \ln(t + (t^2 + 1)^{1/2})
\]
and then use this formula to prove
\[
\frac{d}{dt}(\text{arcsinh } t) = (t^2 + 1)^{-1/2}
\]

5) The vertical motion of a ball is modelled by
\[
s(t) = -16t^2 + 128t + 320,
\]
where \( t \geq 0 \) is time (measured in seconds) and \( s \) is position measured in feet. The upward direction is \( s \) positive and \( s = 0 \) being the ground.

   a) What is the maximum height of the ball?
   b) When does the ball hit the ground?
   c) When is the speed of the ball 64 ft/sec?