9. (16 points) **(a)** Find the local linearization of the function $f(x) = \ln(1 + x)$ near the point $x = 0$. Show your work.

(b) Is the approximation to $\ln(1 + x)$ given by the local linearization an underestimate or overestimate? Explain why?

(c) We saw in Chapter 1 of the text that P_0 dollars invested at a rate of $r\%$ per year grows to be worth $P_0(1 + r/100)^t$ dollars after t years. Compute, in terms of the interest rate r, how long it takes for the invested money to double in value?

(d) A common rule of thumb used by investors is the "Rule of 70" — *money invested at a $r\%$ interest per year doubles in value in $70/r$ years.* Explain why this is a reasonable approximation to the actual doubling time.

(e) Do you think the "Rule of 70" is a more accurate estimate of the doubling time of invested money for large or small interest rates? Why?