. 5 1. Find $\dfrac{dy}{dx}$ for $y = \dfrac{\ln(2x)}{x}$.

Solution. By the chain rule, $\frac{d}{dx}\ln(2x) = 2 \cdot \frac{1}{2x} = \frac{1}{x}$. So the quotient rule gives

$$\frac{dy}{dx} = \frac{\frac{1}{x} \cdot x - \ln(2x)}{x^2} = \frac{1 - \ln(2x)}{x^2}.$$

. 5 2. On my way to class I found a penny (1 cent) on the ground. If I invest it in a savings account with an annual interest rate of 4.5% compounded annually, how many years will it take for my money to double to 2 cents? (Assume the bank keeps track of fractions of a cent.)

Solution. The formula for value of the investment is $P(1+r)^t$ where t is time in years, P is the initial investment and r is the interest rate expressed as a decimal. In this problem we have $P = 1$ and $r = 0.045$, so we need to solve the following equation for t:

$$1(1.045)^t = 2$$

Taking the natural logarithm of both sides, using $\ln(1.044^t) = t\ln(1.044)$, and then dividing by $\ln(1.045)$ we have that $t = \frac{\ln 2}{\ln(1.045)} \approx 15.75$ years. So it will take 16 years.