

3. [10 points] The number of years, t , that it takes a quantity of money to double when it earns an annual interest rate of $r\%$ is given by

$$t = f(r) = \frac{\ln(2)}{\ln\left(1 + \frac{r}{100}\right)}.$$

- a. [3 points] Find a formula for $f^{-1}(t)$; that is, solve the above equation for r in terms of t . *Show your work.*

Answer: $r = f^{-1}(t) =$ _____

- b. [2 points] Write a single equation that represents the statement below. (Your answer may include the letter f .)

Your money takes twice as long to double when it earns 4% interest as it does when it earns 8.2% interest.

Answer: _____

- c. [2 points] Circle the one equation below that best represents the following statement:

Your money takes about three months longer to double when it earns 5.2% interest than when it earns 5.3% interest.

- | | |
|------------------------------|------------------------------|
| i. $f'(5.2) = 0.25$ | iv. $f'(5.2) = -2.5$ |
| ii. $f'(5.2) = -30$ | v. $f'(5.2) = 3$ |
| iii. $f'(5.3) - f'(5.2) = 3$ | vi. $f(5.3) - f(5.2) = 0.25$ |

- d. [3 points] Complete the sentence below by writing positive numbers in the blanks and circling either HIGHER or LOWER to give a practical interpretation of the following equation:

$$(f^{-1})'(12) = -0.5.$$

If your money will double in _____ years at the current interest rate, but you want it to double six months earlier, then you will need to invest at an interest rate that is about _____ percent higher / lower than the current one.