

Math 373
Quiz 2
Spring 2024
February 1, 2024

1. You are given that $a(t) = 1 + 0.01t + 0.0008t^2$.

Calculate δ_{10} .

$$a'(t) = 0.01 + 0.0016t$$

$$\delta_{10} = \frac{a'(10)}{a(10)}$$

$$= \frac{0.01 + 0.0016(10)}{1 + 0.01(10) + 0.0008(10)^2} = \frac{0.026}{1.18}$$

$$= \boxed{0.0220339}$$

2. You want to take out a loan for 2000 to be repaid at the end of six months. You have the choice of the following loans:

- A loan from Bank 1 that charges a monthly effective interest rate of 2% compounded monthly;
- A loan from Bank 2 that charges a nominal discount rate of 8% compounded quarterly; and
- A loan from Bank 3 that charges 8% compounded continuously.

Which loan should you select? Explain why.

Bank 1

$$2000 (1.02)^6 = 2252.32$$

amt of interest
252.32

Bank 2

$$2000 \left(1 - \frac{0.08}{4}\right)^{-2} = 2082.4656$$

82.47

Bank 3

$$2000 e^{0.08(0.5)} = 2081.62$$

81.62

Select Bank 3
 → smallest
 amt to repay

3. Given an annual effective compound interest rate of 4%, calculate the nominal discount rate payable monthly.

$$i = 0.04$$

$$\left(1 - \frac{d^{(12)}}{12}\right)^{-12} = (1.04)$$

$$\left(1 - \frac{d^{(12)}}{12}\right)^{12} = \frac{1}{1.04}$$

$$1 - \frac{d^{(12)}}{12} = \sqrt[12]{\frac{1}{1.04}}$$

$$d^{(12)} = \boxed{0.0391567}$$