Name:
Quiz 4
Math 151, Applied Calculus, Spring 2019

1. A bank advertises an interest rate of 2% per year. If you deposit \$10,000, how much is in the account 4 years later if the interest is compounded

   (a) Continuously?
   Let $P(t)$ be the amount in the account after t years, then since the interest is compounded continuosly,
   $$P(t) = 10,000e^{0.02t}$$
   so that after 4 years ($t = 4$) the balance is
   $$P(4) = 10,000e^{0.02\cdot 4} = 10,000e^{0.08} = 10,832.87$$
   Therefore the balance is \$10,832.87

   (b) Quarterly?
   If the compounding is quarterly,
   $$P(t) = 10,000\big(1 + \frac{0.02}{4}\big)^{4t}$$
   so that after 4 years, the balance is
   $$P(4) = 10,000(1.005)^{4\cdot 4} = 10,000(1.005)^{16} = 10,830.71$$
   Therefore the balance is \$10,830.71.

2. A business associate owes you \$3000 and offers you two options for repayment

   - **Option 1:** \$2800 now.
   - **Option 2:** 3 yearly installments of \$1000 each, with the first installment paid now.

   Assuming a 3% interest rate per year compounded continuously, which option should you choose?
   Option 1: Accept \$2800 now and place it in account earning interest continuously at 3% for 2 years for a comparison with the installments
   $$P_1(t) = 2,800e^{0.03t} \Longrightarrow P_1(2) = 2800e^{0.06} = \$2973.14$$
   Option 2: The first installment is in the bank for 2 years, the second 1 year and the last does not spend any time in the bank so we compute the value of *Option 2* as
   $$P_2(2) = 1000e^{0.03\cdot 2} + 1000e^{0.03\cdot 1} + 1000 = \$3092.29$$
   From the above calculations we conclude that Option 2 is better.