Name: —————————————— **Student Number:** ——————————————

1. The balance in a savings account after t years is given by the formula $A(t) = 5000e^{0.04t}$.

    (a) (2 points) How much money will be in the account after 10 years?

    Solution: After 10 years, there will be:

    $$A(10) = 5000e^{0.04*10} = 5000e^{0.4}$$

    dollars in the account.

    (b) (3 points) How fast is the balance growing after 10 years? (Hint: You can either differentiate or use the fact that the exponential model satisfies a certain differential equation).

    Solution:
    The rate of growth of the balance $A(t)$ is its derivative, $A'(t)$.

    Solution 1: Since $A(t) = 5000e^{0.04t}$, we can differentiate to get that:

    $$A'(t) = \frac{d}{dt}[5000e^{0.04t}]$$

    $$A'(t) = 5000\frac{d}{dt}[e^{0.04t}]$$

    $$A'(t) = 5000e^{0.04t} * 0.04$$

    $$A'(t) = 200e^{0.04t}$$

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So, after 10 years, the balance is growing at the rate of:

$$A'(10) = 200e^{0.04*10}$$

$$A'(10) = 200e^{0.4}$$

dollars per year.

Solution 2: Since $A(t) = 5000e^{0.04t}$, Fact 1 from class tells us that $A(t)$ satisfies the differential equation:

$$A'(t) = 0.04 * A(t)$$

Therefore, after 10 years, the balance is growing at the rate of:

$$A'(10) = 0.04 * A(10)$$

dollars per year.

To solve this problem, we can simply use our answer from part (a) to get:

$$A'(10) = 0.04 * 5000e^{0.4}$$

$$A'(10) = 200e^{0.4}$$

dollars per year.