Submit your solutions to the following problems in lecture on the due date above. Present your work in a clean and organized fashion, either on a printed copy of this document (preferred) or a separate sheet of paper. As stated in the syllabus, late submissions will **not** be accepted.

1. Find the derivatives of the following functions.

   (a) $f(x) = \dfrac{x^2 + 2x - 3}{x + 3}$

   $$f'(x) = \frac{(2x+2)(x+3) - (x^2+2x-3)(1)}{(x+3)^2}$$

   (b) $f(x) = e^x(x^2 + 5)^4$.

   $$f'(x) = (e^x)(x^2+5)^4 + (e^x)(4(x^2+5)^3 \cdot 2x)$$

2. Suppose a population of bacteria is initially 100, and quadruples (i.e. ×4) every minute. Find $P(t)$, the population of bacteria after t minutes. Use your formula to estimate the number of bacteria after 3.5 minutes.

   $$P(t) = 100 \cdot 4^t$$

   $$P(3.5) = 100 \cdot 4^{3.5} = \boxed{12800}$$

3. How much should be deposited into an account paying 7.8% interest, compounded monthly, in order to have a balance of $21,000 after 4 years?

   $$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

   $$21,000 = P\left(1 + \frac{0.078}{12}\right)^{12 \cdot 4}$$

   $$P = \frac{21000}{\left(1 + \frac{0.078}{12}\right)^{48}} = \boxed{15,387.14}$$