You have 20 minutes to complete this quiz which is worth 20 points. Calculators are permitted, but no other aids are allowed. Show all work neatly and in order, and clearly indicate your final answers. Answers must be justified whenever possible in order to earn full credit. When you do use your calculator, sketch all relevant graphs and write down all relevant mathematics.

1. (*5 points*) Suppose that the number of bacteria in a certain colony increases at a rate proportional to the number of bacteria there. If there are initially 30 bacteria in the colony, and after 2 days there are 342 bacteria, find the number of bacteria after 10 days.

2. (*5 points*) Solve the initial value problem $\dfrac{dy}{dt} = -2y + 3$, $y(0) = 1$. Be sure to show all your work.

3. (*10 points*) Suppose $\dfrac{dy}{dx} = \dfrac{2}{x}$ and $y(1) = 0$.

    a. (*5 pts*)   Use Euler's method with 5 steps to approximate $y(5)$.

    b. (*2 pts*)   Is your approximate value of $y(5)$ from **a.** greater than or less than the true value of $y(5)$? Explain.

    c. (*3 pts*)   Sketch an approximation of the graph of $y(x)$ over the interval $[1, 5]$.

(Sources: Coursepack Page 105 #9; Page 110; Page 233 #2)