

Show work for all problems; use the back of the sheet if necessary. Results should, when necessary, be left in the form of unsimplified exponentials, natural logarithms, or base-10 logarithms.

1. **(3 points)** Find the solution of the exponential equation  $2e^{12x} = 17$ .
2. **(3 points)** Find the solution of the exponential equation  $2(3^{2x-1}) + 4 = 58$ .
3. **(4 points)** The population of Opal City is currently 20000, and the observed relative growth rate is 4.5% per year. Write a function modeling its population  $t$  years from now, and determine how long it will take for the population to reach 25000.
4. **(4 points)** The temperature in degrees Fahrenheit of a set of biological samples  $t$  minutes after being taken out of a deep-freeze is given by the function  $T(t) = 65 - 75e^{-0.1t}$ . The samples will become biologically active when they reach 20°F. How long will it take for this to happen?
5. **(3 points)** Find the reference number and terminal point for  $t = \frac{7\pi}{3}$ .
6. **(3 points)** Find the reference number and terminal point for  $t = \frac{-41\pi}{4}$ .