

General Questions/Things You Should be Familiar With

- Finding exponential equations
- Big-Little Principle
- What is a polynomial? What is a rational function? What's the relationship between them?
- algebra related to exponents and fractions (Exponent rules, fraction rules)
- What is a logarithm? What is the defining property of logarithms? How do they relate to exponential functions? How do we use them to solve equations?
- Algebra of logarithms (i.e. "log rules")

Practice Problems

1. Let $r(t) = \frac{10t^6 + 7t^4 + 9t + 10t^9}{7.3t^2 - 2t - 9}$ and $s(t) = \frac{10t^6}{90t - 10t^7}$. Find the domains of each function, and compute the long-run behavior of each as $t \rightarrow \infty$ and $t \rightarrow -\infty$.
2. Suppose you have a bank account with an initial value of \$5,000, which grows to a value of \$13,000 over the course of 10 years.
 - (a) If the interest is compounded semiannually, then what was the interest rate attached to the account?
 - (b) If the rate is as given in part (a), then what is the account worth after 15 years since the initial deposit?
 - (c) Assuming the same rate from part (a), how long does it take for the account to reach \$30,000?
3. Find the equation of an exponential function going through the points (100, 95) and (10, 2).
4. Suppose that a bacteria colony grows with a continuous growth rate of 10% an hour. Devise an exponential model that describes such a bacteria colony that initially has 10 bacteria. Then model a bacteria colony that increases by 10% each hour, again with initially 10 bacteria. Which has a higher population after 10 hours? Decide which kind of growth rate (continuous or hourly) describes faster growth.
5. Suppose that you drink a cup of coffee, which has about 150 milligrams of caffeine. Assume that the half-life of caffeine in your blood stream is about 5 hours. You can fall asleep if the amount of caffeine in your blood stream is less than 50 milligrams. If you want to take a nap after drinking the coffee, how long will you have to wait?
6. The value of two cars, car A and car B, are depreciating at different rates. Car A depreciates at a constant rate of \$1000 each year, while car B depreciates at a continuous rate of 3% each year. Come up with a model for each car, assuming each car started with a value of \$25,000.