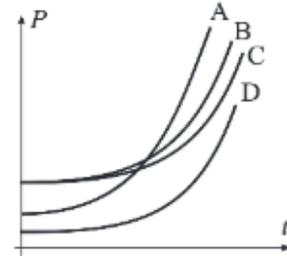


Practice for Exam 2, MTH 122

1. The accompanying graph shows population growth curves for four different nations. Which nation(s)
- has the greatest growth rate?
 - has the smallest growth rate?
 - has the largest initial population?
 - has the smallest initial population?
 - have the same growth rate?



2. Determine which of the data are exponential. If exponential what is their growth/decay factor?

| | | | | |
|-----|--------|-----------|------------|------------|
| 0 | 1 | 2 | 3 | 4 |
| 230 | 242.88 | 256.48128 | 270.844232 | 286.011509 |

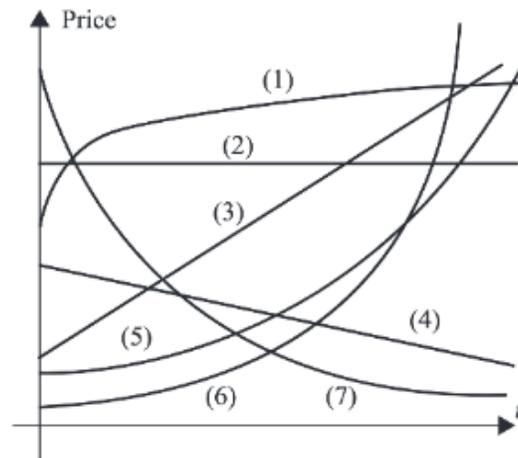
| | | | | |
|-----|--------|--------|---------|---------|
| 0 | 1 | 2 | 3 | 4 |
| 230 | 243.82 | 258.25 | 267.392 | 289.347 |

| | | | | |
|-----|-------|---------|-----------|------------|
| 0 | 1 | 2 | 3 | 4 |
| 490 | 426.3 | 370.881 | 322.66647 | 280.719829 |

| | | | | |
|-----|--------|--------|---------|----------|
| 0 | 1 | 2 | 3 | 4 |
| 490 | 428.91 | 379.61 | 337.241 | 298.4201 |

3. The 2006 population of Venezuela was 27.0 million people and growing exponentially at an annual rate 1.7%.
- Find an expression for the population at any time t .
 - Assuming this trend continues what will be the population in 2010?
 - Assuming that this was the trend back in time to 2001, what was the population in 2003?
 - Estimate the doubling time for the population in 2018.
4. In 1990, the US imported \$759 billion worth of goods. In 2004, the US imported \$2,118 billion worth of goods. Assuming that the growth in imports has been following an exponential growth pattern, find an equation of the exponential function that models the US imports when the independent variable t represents the number of years since 1990.

5. The accompanying figure shows the graph of the value of each of seven old baseball cards as a function of time. Match each scenario (a)–(d) with one of the graphs (1)–(7) and write a brief scenario for each of the remaining graphs.



- The price of the card increased by 12% each year.
 - The price of the card increased by 5% each year.
 - The price of the card dropped by \$10 each year.
 - The price of the card remained steady.
- e. If all of the cards were worth \$100 at one time, write a formula for the value V of each as a function of time t for each of the scenarios in (a)–(d).

6. The level of ampicillin (a form of penicillin) in the bloodstream decreases by about 42% every hour.
- If the dosage of ampicillin is 250 mg, write a function that models the level of ampicillin in the blood as a function of time, if one dose is taken.
 - How much ampicillin is left in the blood after 6 hours?
 - Estimate how long it will take for the level of ampicillin to drop to 1 mg.

7. Simplify

- $\log x^4 + \log x^3 - \log x^5$
- $\log 10^{x^9}$
- $8^{-2x} / 8^{3x}$
- $(6^t)^3$

8. Use logarithms to solve the equation $3(1.0654)^t = 10$ for t .

9.

7. The following table shows the cumulative number of HIV infections, worldwide, in millions, since 1980.

| Year | 1980 | 1985 | 1990 | 1995 | 1998 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------|------|------|------|------|------|------|------|------|------|------|------|
| HIV cases | 0.1 | 2.4 | 10.0 | 29.8 | 46.6 | 57.9 | 62.9 | 67.9 | 72.9 | 77.8 | 82.7 |

Source: Lester R. Brown, et al., *Vital Signs 2006–07: The Environmental Trends that are Shaping our Future*.

- Assuming that the number of people infected with HIV is growing exponentially, find a function that fits these data, where t represents the number of years since 1979.
- What is the growth factor in your function and what does it mean?
- Predict the total number of people who will have been infected with HIV by 2010.
- How does the actual growth in the number of people infected with HIV compare to the growth of this exponential function? That is, does the function grow faster or slower than the actual data?

10. How much stronger is a magnitude 6 earthquake than a magnitude 3 earthquake?

Problems 10–13 are based on the carbon dating process for measuring the age of objects. Carbon-14, a radioactive isotope, decays into carbon-12 with a half-life of 5730 years.

10. The famous Cro-Magnon cave paintings are found in the Lascaux Cave in France. If the level of carbon-14 radioactivity in charcoal in the cave is approximately 14% of the level of living wood, estimate how long ago the cave paintings were made. (*Hint*: Let the initial amount of carbon-14 be C_0 .)