Lesson 35 – Characteristics of Exponential Functions

Math 2 Honors - Santowski

Review of Exponent Laws

- 17) $\frac{2k^3 \cdot k^2}{k^{-3}}$
- 18) $\frac{\left(x^{-3}\right)^4 x^4}{2x^{-3}}$
- 19) $\frac{(2x)^{-4}}{x^{-1} \cdot x}$
- 20) $\frac{\left(2x^3z^2\right)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$
- 21) $\frac{\left(2pm^{-1}q^0\right)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$
- 22) $\frac{\left(2hj^2k^{-2} \cdot h^4j^{-1}k^4\right)^0}{2h^{-3}j^{-4}k^{-2}}$

(A) Modeling Example

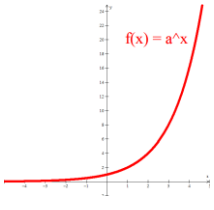
- The following data table shows the relationship between the time (elapsed from when I first poured the water into my coffee cup) and the temperature of my coffee:

http://mrsantowski.tripod.com/IBSLY2/Assignments/NEWTONSLAWDATA.htm

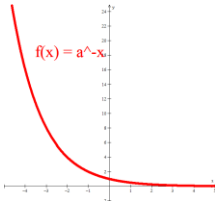
- (a) Graph the data on a scatter plot
- (b) How can you graphically analyze the data to help determine a model for the data?
- (c) How can you numerically analyze the data to help determine a model for the data?
- (d) Write an equation to model the data. Justify your choice of models.

(B) Exponential Parent Functions

- The features of the parent exponential function $y = a^x$ (where $a > 1$) are as follows:



- The features of the parent exponential function $y = a^x$ (where $0 < a < 1$) are as follows:



(B) Exponential Parent Functions

- The features of the parent exponential function $y = a^x$ (where $a > 1$) are as follows:
  - Domain ➔
  - Range ➔
  - Intercept ➔
  - Increase/decrease on ➔
  - Asymptote ➔
  - As $x \to -\infty$, $y \to$
  - As $x \to \infty$, $y \to$
- The features of the parent exponential function $y = a^x$ (where $0 < a < 1$) are as follows:
  - Domain ➔
  - Range ➔
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  - Asymptote ➔
  - As $x \to -\infty$, $y \to$
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(C) Transforming Exponential Functions

- Recall what information is being communicated about the function $y = f(x)$ by the transformational formula

$$y = af\left(b\left(x+c\right)\right)+d$$

(C) Transforming Exponential Functions

- You will be divided into groups and each group will investigate the effect of changing the parameters on the characteristics of the function

$$y = aZ^{(b(x+c))} + d$$

- Where:

Group	a	Z	b	c	d
1	a > 1	Z > 0	b > 1	c > 0	d > 0
2	a < -1	Z > 0	0 < b < 1	c < 0	d > 0
3	0 < a < 1	Z > 0	b < -1	c > 0	d > 0
4	-1 < a < 0	Z > 0	-1 < b < 0	c > 0	d < 0
5	a > 1	Z > 0	b < -1	c < 0	d < 0

(C) Transforming Exponential Functions

- Your analysis will involve:
  - Domain ➔
  - Range ➔
  - Value of the Y Intercept ➔
  - Value of the X-intercept ➔
  - Increase/decrease on ➔
  - Asymptote ➔
  - As $x \to -\infty$, $y \to$
  - As $x \to \infty$, $y \to$

(D) Exponential Modeling

- Investments grow exponentially as well according to the formula $A = P_o(1 + i)^n$. If you invest $500 into an investment paying 7% interest compounded annually, what would be the total value of the investment after 5 years?
- (i) You invest $5000 in a stock that grows at a rate of 12% per annum compounded quarterly. The value of the stock is given by the equation $V = 5000(1 + 0.12/4)^{4x}$, or $V = 5000(1.03)^{4x}$ where x is measured in years.
  - (a) Find the value of the stock in 6 years.
  - (b) Find when the stock value is $14,000

Homework

- From the Larson Text:
- Section 3.1, p185, Q15-22,35,37,35,57,63-70
- If you have the time and interest, graph any of the equations presented in Q39-54