

## Math142 Week In Review # 3

### The Most Important Problems to Understand - This Week

1. Describe each of the functions below, as related to the graph of  $y = 3^x$ .

- |                        |   |
|------------------------|---|
| a. $f(x) = 3^{-x}$     | a. rigid transformation reflected about the y-axis        |
| b. $g(x) = -3^x$       | b. rigid transformation reflected about the x-axis        |
| c. $h(x) = -3^{-x}$    | c. rigid transformation reflected about the x- and y-axis |
| d. $F(x) = 3^x + 2$    | d. rigid transformation shifted up 2 units                |
| e. $G(x) = 3^{x+2}$    | e. rigid transformation shifted left 2 units              |
| f. $H(x) = 3^{-(x-2)}$ | f. reflected about the y-axis and shifted right 2 units   |

2. Solve the following equations:

- |                                |                             |
|--------------------------------|-----------------------------|
| a. $5^{4x-x^2} = 5^{-5}$       | 2a. $x=5, x=-1$             |
| b. $(2x+1)^3 = (1-x^2)^3$      | 2b. $x=0, x=-2$             |
| c. $3xe^{-x} + 6x^2e^{-x} = 0$ | 2c. $x=0, x = -\frac{1}{2}$ |

3. How much should Shane invest in a CD which pays 6.75% compounded weekly, if he is wanting a balance of \$32,000 in six years to buy a new car?

3. \$21,348.86

4. Let  $t$  represent the number of months since Mandy began studying Spanish.  $V$  represents the number of vocabulary words (in hundreds) that Mandy has learned. According to the model,  $V(t) = 50(1 - 2e^{-0.1t}) + 50$ , what is the approximate upper limit of words she can learn in Spanish? **4. 10,000 words**

5. The chart below lists the Yankees annual payroll salary. Define  $t$  as the number of years since 1980, and  $S$  as the payroll salary for the team in million of dollars.

| Year | Salary in Millions of \$'s |
|------|----------------------------|
| 1984 | 15                         |
| 2000 | 95                         |
| 2004 | 187                        |
| 2008 | 209                        |

Find the best fitting linear regression, quadratic regression, and exponential regression.

- a. Which model is best for predicting the annual payroll salary for 2009? **5a. exponential regression : highest  $r^2$  value, and salaries are increasing that fast!**
- b. What payroll salary does answer "a" predict for 2009? **5b.  $S \approx 272.7$  million dollars**

6. Classify each of the following as exponential *growth*, or exponential *decay*.

- a.  $A(t) = \left(\frac{4}{5}\right)^t$  **6a. decay**
- b.  $A(t) = 2^{4-2t}$  **6b. decay**
- c.  $A(t) = e^{-(5-t)}$  **6c. growth**

7. A model for the number of bacteria in a culture  $t$  hours after exposure is given by:

$$N(t) = 240e^{0.25t}$$

a. What was the initial population?

7a. 240 bacteria

b. What was the population 8 hours after exposure?

7b. 1773 bacteria

8. Simplify:

a.  $\frac{(-2e^{2x})^3}{e^x + 3e^x}$

8a.  $-2e^{5x}$

b.  $4^{x+5} \cdot 32^{2x}$

8b.  $2^{12x+10}$

c.  $2^x + 2^{2x}$

8c. cannot be simplified

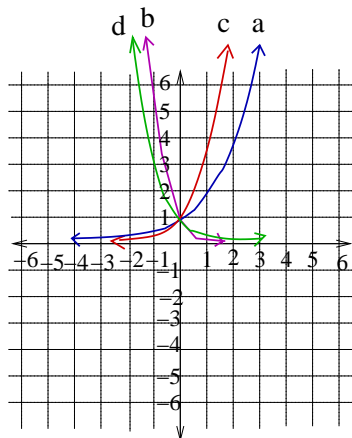
9. Match each graph below with its most likely function.

a.  $f(x) = 2^x$

b.  $g(x) = \left(\frac{1}{8}\right)^x$

c.  $h(x) = 4^x$

d.  $k(x) = 3^{-x}$



10. Which of the following functions are 1-1?

a.  $y_1 = |x^2 - 3|$

10a. not 1-1

b.  $y_2 = (x + 4)^2 - 1, \quad x \geq -4$

10b. not 1-1

c.  $y_3 = \sqrt{4x + 1}$

10c. 1-1

d.  $y_4 = 2$

10d. not 1-1

11. Rewrite in exponential form:

a.  $\log_2(x) = -1$

11a.  $x = \frac{1}{2}$

b.  $\log(x + 1) = 0$

11b.  $x = 0$

c.  $\ln(2x) = 3$

11c.  $x = \frac{1}{2}e^3$

12. Find the domain of:

a.  $f(x) = \log_2(x - 1)$

12a.  $x > 1$

b.  $g(x) = \ln(x^2 - 4)$

12b.  $x > 2$  or  $x < -2$

c.  $h(x) = \frac{\log(10 - x)}{\ln(x - 2)}$

12c.  $(2, 3) \cup (3, 10)$

13. Find the inverse of each of the following if possible:

a.  $y = \log x$

b.  $y = x^2$

c.  $y = e^{2x}$

13a.  $y^{-1} = 10^x$

13b. not 1-1, no inverse

13c.  $y^{-1} = \frac{1}{2} \ln x$

14. If  $\log_a 2 = 1.5$ ,  $\log_a 3 = 2.75$ , and  $\log_a 5 = d$ , evaluate each of the following:

a.  $\log_a 2250$

b.  $\log_a 6d^3$

14a.  $7 + 3d$

14c.  $4.25 + \log_a d^3$

15. Solve for  $x$ :  $\log_b(x + 2) + \log_b x = \log_b 24$

15.  $x = 4$