

---

---

## Homework Problems

### Lecture 4 Solution Key

1. List a social policy or environmental initiative that may have a logarithmic effect on the problem it attempts to address; what is a government initiative or a factor that may have an exponential effect?

**Logarithmic Effect:** Any initiative that will have a diminishing impact over time. For example, a smoking ban will lead to quitting among occasional smokers, but will not affect persistent smokers.

**Exponential Effect:** Any initiative that will have an increasingly large impact over time. An example is China's 1-child rule—you are not only limiting the number of children a family has, but the number of future parents...

2. We learned on Tuesday that Steve is 25 years old and Craig is 15. They recently met Jenny whose is equal to

$\frac{(2C - S)^3}{\sqrt{25}}$ . In what year will...

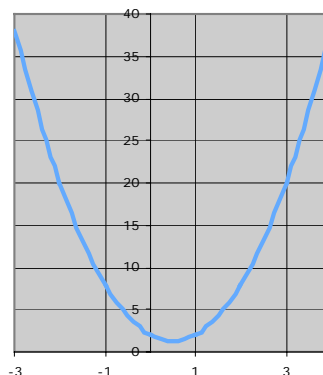
- a. The mean age of all 3 be equal to 25? **First, calculate Jenny's age. She is**

$$\frac{(2 \cdot 15 - 25)^3}{\sqrt{25}} = \frac{(30 - 25)^3}{5} = \frac{5^3}{5} = 25$$

- b. The median age of all 3 be equal to 25? **The median is 25 right now.**
- c. The mode age of the group be equal to 25? **The mode is 25 right now.**

3. Graph the following equation:  $y = 3x^2 - 3x + 2$

See right. The vertex is  $\left(\frac{1}{2}, \frac{5}{4}\right)$ , the y-intercept is 2 and there are no x-intercepts.



4. Imagine you are a policymaker studying income in the Puget Sound Region. How is the presence of Bill Gates and other Microsoft Millionaires likely to cause you a problem? What is one way to resolve it?

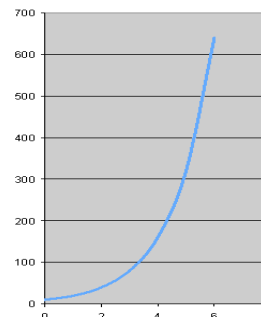
**The mean will be skewed because Bill Gates' salary has so much weight. You could calculate the median instead of the mean to give a more accurate view.**

5. Poverty has been growing at an alarming rate in Pleasantville. Every month the number of citizens in poverty is twice that of the month before. Sketch a graph comparing the month to the number of the poor.

See right. The slope is positive and is increasing.

6. What is the *y-intercept* of the following equation? **-7/24**

$$\frac{x - 7}{6y + 2x} = 4$$



$$x - 7 = 4(6y + 2x)$$

$$x - 7 = 24y + 8x$$

$$24y = -7x - 7$$

$$y = -\frac{7}{24}x - \frac{7}{24}$$

7. U.S. unemployment in July was 5.7%. In August, it was 6.1%. In the June, it was 5.5%. What must the unemployment rate be in September if the mean of the unemployment rate from June through September is no more than 5.5%? Assume that the population stays constant through the year.

$$\frac{.057 + .061 + .055 + x}{4} \leq .055$$

$$.173 + x \leq .22$$

$$x \leq .047$$

8. Calculate the mean, the median and the mode for the following set of fractions:

$$\frac{3}{7}, \frac{9}{5}, \frac{2}{3}, \frac{5}{8}, \frac{2}{7}, \frac{1}{2} \rightarrow \frac{2}{7}, \frac{3}{7}, \frac{1}{2}, \frac{5}{8}, \frac{2}{3}, \frac{9}{5} \quad \text{mean: } 5/7 \quad \text{median: } 9/16 \quad \text{mode: there is none}$$

9. Solve for  $q$ :  $\frac{q^4}{16} = -q^3 - 4q^2$

$$q^4 = -16(q^3 + 4q^2)$$

$$q^4 + 16q^3 + 64q^2 = 0$$

$$q^2(q^2 + 16q + 64) = 0$$

$$q^2(q + 8)^2 = 0$$

$$q = 0, -8$$

10. The factory manager has a wage that is based upon the wage of his/her employees and the factory's productivity. The manager makes twice the wage of the employee plus a dollar value that is equal to 20% of the number of units produced. Currently, the manager is paid \$18/hr. The employees work harder when they get paid more: they produce a number of units that is equivalent to 125% of the dollar amount of their wage. With this information, how much are the employees currently producing every hour and what is their wage?

**M=Manager's wage E=Employee wage U=Units produced**

**M=2E+.2U and M=18 and U=1.25E**

**First, plug in the value for M: 2E+.2U=18**

**Next, substitute U=1.25E in the equation: 2E+.2(1.25E)=18**

$$2.25E=18 \quad E=8, \quad U=1.25E = 1.25(8) = 10$$

11. Without graphing the equation  $7 + 12x = 2x^2 + 3$ , identify the coordinates of its vertex.

$$2x^2 - 12x - 4 = 0 \quad \left( \frac{-b}{2a}, \frac{4ac - b^2}{4a} \right) = \left( \frac{12}{2 \cdot 2}, \frac{(4 \cdot 2 \cdot -4) - 12^2}{4 \cdot 2} \right) = \left( \frac{12}{4}, \frac{-32 - 144}{8} \right) = \left( 3, \frac{-176}{8} \right) = (3, -22)$$