

Math 1311

**Homework 8 (Section 4.3- Section 4.5)**

Record your answers to all the problems in the EMCF titled “ **Homework 8**” .

For questions 1-3: Use the information below.

Sound exerts a pressure on the human ear. This pressure  $P$ , measured in dynes per square centimeter, increases as the loudness of the sound increases. As the loudness  $D$ , measured in decibels, increases, the pressure increases by 12.2% per decibel. Furthermore, a sound of loudness 97 decibels produces a pressure of 15 dynes per square centimeter.

1. Find  $P(0)$  and use it to give a formula for  $P = P(D)$  in this situation.
  - a)  $P(0) = 0.0002122$ ;  $P(D) = 0.0002122(1.122)^D$
  - b)  $P(0) = 0.0002122$ ;  $P(D) = 0.0002122(2.122)^D$
  - c)  $P(0) = 0.0002122$ ;  $P(D) = 0.0002122(2.252)^D$
  - d)  $P(0) = 0.0002122$ ;  $P(D) = 0.0002122(3.124)^D$
2. What is the pressure on the ear from a sound of 50 decibels?
  - a) 0.06704
  - b) 0.6704
  - c) 0.0852
  - d) 0.8523
3. When the pressure on the ear reaches a level of about 200 dynes per square centimeter, physical damage can occur. What decibel level should be considered dangerous?
  - a) 125.6 decibels
  - b) 119.5 decibels
  - c) 117.6 decibels
  - d) 113.9 decibels

For questions 4-6: Use the information below.

DDT (dichlorodiphenyltrichloroethane) was used extensively from 1940 to 1970 as an insecticide. It still sees limited use for control of disease. But DDT was found to be harmful to plants and animals, including humans, and its effects were found to be lasting. The following table shows what can be expected of 100kg of DDT that has seeped into the soil.

<i>t = years since application</i>	0	1	2	3
<i>D = DDT remaining</i>	100	95	90.25	85.74

4. Is this data exponential?  
a) Yes, the data is exponential  
b) No, the data is not exponential
5. Make a model of  $D$  as an exponential function of  $x$ .  
a)  $D(x) = 100(0.85)^x$   
b)  $D(x) = 100(0.95)^x$   
c)  $D(x) = 100(1.85)^x$   
d)  $D(x) = 100(1.95)^x$
6. What is the half-life of DDT in the soil? That is, how long will it be before only 50kg of DDT remain?  
a) 15.5 years  
b) 14.5 years  
c) 13.5 years  
d) 12.5 years
7. A certain quantity has an initial value of 8.2 and grows at a rate of 8.5% per year. Give an exponential function that describes this quantity after  $x$  years.  
a)  $f(x) = 8.2(1.085)^x$   
b)  $f(x) = 7.2(1.853)^x$   
c)  $f(x) = 6.2(1.083)^x$   
d)  $f(x) = 5.2(1.085)^x$
8. Another quantity has initial value of 400 and decays at a rate of 5.2% per hour. Give an exponential function that describes this quantity after  $x$  hours.  
a)  $f(x) = 200(0.563)^x$   
b)  $f(x) = 400(0.948)^x$   
c)  $f(x) = 600(0.635)^x$   
d)  $f(x) = 800(0.863)^x$

For questions 9-11: Use the information below.

A 1000-gallon oil spill has contaminated a reservoir. The company hired to clean the reservoir can remove 10% of the remaining oil each week.

9. Give the formula for  $A = A(w)$  which gives the amount of oil remaining in the reservoir after  $w$  weeks.

a)  $A(w) = 1000(0.9)^w$

b)  $A(w) = 2000(1.9)^w$

c)  $A(w) = 1000(2.9)^w$

d)  $A(w) = 2500(0.9)^w$

10. How long will it be until there are only 400 gallons of oil still in the reservoir?

a) 11.8 weeks

b) 10.8 weeks

c) 9.7 weeks

d) 8.7 weeks

11. If the cleanup company charges \$7600 per week for its services, how much will it cost to remove the first 900 gallons of oil from the reservoir?

a) \$ 200,000

b) \$ 180,000

c) \$ 167,200

d) \$ 178, 300

For questions 12-13: Use the information below.

A model for the world's population for the years 1900 to 2010 is  $P(x) = 1.6(1.014)^x$  billion people  $x$  years after 1900.

12. According to the model, at what rate was the population growing during these years?

a) 1.7 % per year

b) 1.4 % per year

c) 2.7 % per year

d) 2.4 % per year

13. In what year, according to the model, did the world population reach 5 billion?

- a) 1985
- b) 1984
- c) 1983
- d) 1982

14. Find the common logarithm of  $\log 10^{655.77}$ .

- a) 655.77
- b) 1509.97
- c) 6557.70
- d) 425.32

15. Solve the equation  $\log 2x = -5$ .

- a) 2.5
- b) -2.5
- c) 0.000005
- d) 0.025

16. Find how  $x$  and  $y$  compare when  $\log x = 6.6$  and  $\log y = 3.6$ .

- a)  $y$  is 100 times  $x$
- b)  $y$  is 0.001 times  $x$
- c)  $y$  is 0.01 times  $x$
- d)  $y$  is 10 times  $x$

17. One earthquake has a Richter scale reading of 5.5. A second is 100 times as strong. What is its Richter scale reading?

- a) 1.6
- b) 7.5
- c) 6.5
- d) 8.5

18. Acidity of a solution is determined by the concentration  $H$  of hydrogen ions in the solution (measured in moles per liter of solution). Chemists use the negative of the logarithm of the concentration of hydrogen ions to define the  $pH$  scale.  $pH = -\log H$

Solution  $A$  has a  $pH$  value of 5.6 and solution  $B$  has a  $pH$  value of 2.7. Compare the acidity of the two solutions.

- a) Solution  $A$  is more acidic by a factor of 2.07
- b) Solution  $B$  is more acidic by a factor of 794.33
- c) Solution  $A$  is more acidic by a factor of 794.33
- d) Solution  $A$  is more acidic by a factor of 2.90

19. Section 4.3 Skill Building Exercise S-2

- a)  $N = \frac{6}{13^t}$
- b)  $N = \frac{13}{6^t}$
- c)  $N = \frac{9}{13^t}$
- d)  $N = \frac{13}{9^t}$

20. Section 4.3 Skill Building Exercise S-8

- a)  $y = 3.6 \times 2^x$
- b)  $y = 4.6 \times 3^x$
- c)  $y = 2.6 \times 3^x$
- d)  $y = 1.6 \times 4^x$