Pratt

Math 150 – Fall 2020
Algebra & Trigonometry

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Session 7: Monday 10/19/20
6:30pm - 9:20pm
via REMOTE LEARNING
Revision 1

Instructor Contact Information

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Fall 2020 Virtual Office hours *ONLY*
Wednesdays 10:00am-2:00pm via Zoom Meeting
To make your appointment
Send me an email at least one day in advance :
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This Class Session #07

<u>*In class* – Session 7: Monday 19 October:</u>
- ***DUE:* Homework Set #06 by 12:00Noon 19 October!**
- ***NOTE: Quiz 6 = four problems from hwk (*)***
- ***Review: Exam #1; Homework Set #05; Textbook readings***
- ***Lecture: Logarithmic and Exponential Models***

<u>*In class* – Session 7: Monday 26 October:</u>
- ***DUE:* Homework Set #07 by 12:00Noon 26 October!**
- ***NOTE: Quiz 7 = four problems from hwk***
- ***Review:* Homework Set #06; Textbook readings**
- ***Lecture: Trigonometric Functions***

About the Homework Quizzes

I have selected four (4) problems from each homework for you to submit and - as long as at least three are answered correctly - receive 'quiz' credit of 3% for correct answers.

These are the selected problems for the remaining homework assignments:

HWK #07: Section 3.1: 10, 60 and Section 3.4: 10, 16
HWK #08: Section 1.4: 82c and Section 1.5: 42, 54, 60
HWL #09: Number: 2, 4, 6, 8
HWK #10: Section 7.8: 4, 8, 10, 14

Homework is due not later than 12:00pm Noon ET on day of our class session.
If not emailed by then, a zero grade will be entered

Emailing me your Homework

As noted, I have selected four (4) problems from each homework for you to submit each week per the previous slide.
Homework is due not later than Noon class days.

HOW TO PREPARE YOUR ASSIGNMENT:

1. *Use DARK BLACK pencil or pen on WHITE paper.*
   If I can't read your work you get a ZERO!
2. *Please scan your work as a PDF and save it as* ***lastname_xx.pdf***

HOWEVER – IF YOU CAN NOT SCAN –

a. *Take a photo of your work*
b. *Insert the photo(s) into a Word document*
c. *Save as* ***lastname_xx.docx*** *or* ***lastname_xx.pdf***

Then email your file to me: ***crubenst@pratt.edu***
Email me ONLY the requested four (4) problems.
(Email any you might be challenged by in a separate document)

Math 150 – Class Topics

1. **The Foundations of Algebra**
2. **Equations and Inequalities**
3. **Functions**
4. **Polynomial Functions**
5. **Rational Functions and Conic Sections**
6. **Exponential and Logarithmic Functions**
7. **The Trigonometric Functions**
8. **Analytic Trigonometry**
9. **Applications of Trigonometry**
10. **Systems of Equations and Inequalities**
11. **Matrices, Linear Systems, and Determinants**
12. **Topics in Algebra**

Draft Schedule: Math 150 – Fall 2020 – Remote Learning

Monday	Notes
24-Aug	1. Introduction: Numbers, Arithmetic Operations, Fractions
31-Aug	2. Manipulation of Algebraic Expressions; *Hwk #1 Due @ Noon*
7-Sep	NO CLASSES – Labor Day
14-Sep	3. Solving Linear and Quadratic Equations of One Variable; *Hwk #2 Due*
21-Sep	4. Solving Equations of Two Variables; *Hwk #3 Due*
28-Sep	NO CLASSES – Instructor Holiday
5-Oct	5. Creating Equations: Polynomials, Exponents & Logarithms *Hwk #4 Due*
12-Oct	6. Functions, Graphing, Exponents and Logarithms; *Hwk #5; Exam #1*
19-Oct	7. Logarithmic and Exponential Models; *Hwk #6; Exam #1 Review*
26-Oct	8. Trigonometric Functions, Pythagorean Theorem; *Hwk #7 Due*
2-Nov	9. Applications of Trigonometry; *Hwk #8 Due*
9-Nov	10. Analytic Trigonometry: Identities & Graphing; *Hwk #9 Due; Exam #2*
16-Nov	11. Areas and Volumes of Geometric Solids; *Hwk #10; Exam #2 Review*
23-Nov	12. Systems of Equations and Inequalities
30-Nov	13. Series and Sequences, Review topics
7-Dec	Final Examination *Exam Emailed Monday 9:00am - Due at 1:00pm ET ?*

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www.CharlesRubenstein.com/150

20fa07.pdf = *This slide set**

20fa07_h.pdf = *slides as 6-up handouts**

**My goal is to post these not later than Noon on the Friday or Saturday before our Zoom Class Meetings*

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Questions?

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Exam #1

REVIEW

7 @ 10 point Questions

6 @ 5 point Questions

Average: 96!

Low: 86 High: 100

 10

Exam Review

About errors I saw…

Questions **Q1-Q7, Q9** were NOT equations!

They were expressions that were NOT solvable, NOR were they reduceable.

'Reduced answer' errors: – 2 points
Arithmetic errors: – 2 points
Units missing: – 2 points
MAJOR errors: 50% (-3 for 5 pointers, -5 for 10 pointers)
Transcription errors: – 1 point

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Exam Review

#1. **"Carry out the indicated operations* (5 points each):"**

$$2x\,(3x + 4) =$$

$6x^2 + 8x$ ***final answer***

#2. **"Carry out the indicated operations* (5 points each):"**

$$(8x - 2) - (2x + 5) =$$

$$8x - 2 - 2x - 5 =$$

$6x - 7$ ***final answer***

**Note: These are NOT equations!*

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Exam Review

#3. "Carry out the indicated operations* (5 points each):"

$$-(2x - 5) + (8z - 2) =$$

$$-\ 2x + 5 + 8z - 2 =$$

$-2x + 8z + 3$ *final answer*

#4. "Carry out the indicated operations* (5 points each):"

$$(4x - 2) \bullet (4x - 5) =$$

$$(4x) \bullet (4x) + (4x) \bullet (-5) - 2 \bullet (4x) + (-2) \bullet (-5)$$

$$16x^2 - 20x - 8x + 10 =$$

$16x^2 - 28x + 10$ *final answer*

**Note: These are NOT equations!*

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Exam Review

#5. "Carry out the indicated operations* (5 points each):"

$$(a + b)(x + y + z) =$$

$$a\,(x + y + z) + b\,(x + y + z)$$

$ax + ay + az + bx + by + bz$ *final answer*

#6. "(10 points) Simplify*:" $\frac{(x^2y^3)^2}{xy^5}$

Note: $(x^2y^3)^2 = (x^2y^3)(x^2y^3) = (x^{2+2}\,y^{3+3}) = (x^4y^6)$

Also: $(x^4y^6) = (x^{1+3}\,y^{5+1}) = (xy^5)\,(x^3y)$

Therefore, $\frac{(xy^5)\,(x^3y)}{(xy^5)} = x^3y$ *final answer*

**Note: These are NOT equations!*

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Exam Review

#7. "(10 points) Factor the following expression*:"

$$\frac{x}{4} + 3\left(\frac{y}{4}\right) =$$

$$\tfrac{1}{4}(x) + \tfrac{3}{4}(y) =$$

$\tfrac{1}{4}(x + 3y)$ or $\frac{1}{4} + \frac{3y}{4}$ *final answer*

**Note: These are NOT equations!*

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Exam Review

#8. "(10 points) Find the second factor in:"

$$4x^2 + 11x + 6 = (4x + 3)\;(\ ?\ )$$

As $(4x + 3)\,(ax + b) = 4ax^2 + 4bx + 3ax + 3b$

The two sets of coefficients can be equated:

Thus if $4ax^2 = 4x^2$ then $a = 1$

And if $(4b + 3a)x = 11x$; $4b + 3 = 11$; $4b = 8$; $b = 2$

Note as well that $3b = 6$ which confirms $b = 2$

$(x + 2)$ *final answer*

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Exam Review

#9. "(10 points) Write as a single fraction*:" $\frac{1}{x-1} - \frac{3x-1}{(x-1)^2}$

$$\frac{1}{x-1} - \frac{3x-1}{(x-1)^2} = \frac{(x-1)}{(x-1)}\frac{1}{x-1} - \frac{3x-1}{(x-1)^2} = \frac{(x-1)-(3x-1)}{(x-1)^2} = \frac{-2x}{(x-1)^2}$$

$-2x / (x - 1)^2$ *final answer*

**Note: This was NOT an equation!*

#10. "Solve the following equations (5 points):"

$$4x - 20 = 24$$

$$4x - 20 + 20 = 24 + 20$$

$4x = 44$ and thus $x = 11$ *final answer*

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Exam Review

#11. "Solve the following equations (10 points) (Solve by cross multiplication):"

$$\frac{1}{x-1} = \frac{3}{x+5}$$

$$1(x+5) = 3(x-1)$$

$$x + 5 = 3x - 3$$

$$x - 3x = -3 - 5$$

$$-2x = -8$$

$x = 4$ *final answer*

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Exam Review

#12. "Solve the following equations: (10 points) You paid $350 for a new coat when it was on sale for 25% off of its original price. What was the original price?"

Original Price = p; Discounted Price = d

$$d = p\,(1 - 0.25)$$

$$350 = 0.75\,p$$

$$350 / 0.75 = p$$

p = $466.67 original cost ***final answer***

Exam Review

#13. "Solve the following equations: (10 points) Solve the following problem by writing and solving an equation: Find three consecutive integers whose sum is 15.:"

$$(x) + (x + 1) + (x + 2) = 15$$

$$(3x + 3) = 15$$

$$3x = 12$$

$$x = 4$$

thus 4, 5, and 6 ***final answer***

Questions?

Homework #5
REVIEW
Section 2.4 Problems

Applications of Quadratic Equations
pp 128-129:
Problems 1, 4, 5, 6, 8, 11, 12, 21

Homework #5 Review

2.4 #1. **Pg 128** "*Working together, computers A and B can complete a data-processing job in 2 hours. Computer A working alone can do the job in 3 hours less than computer B working alone. How long does it take each computer to do the job by itself?*"

Time for A alone: $x-3$
Time for B alone: x

	rate	· time	= work done
Computer A	$\frac{1}{x-3}$	2	$\frac{2}{x-3}$
Computer B	$\frac{1}{x}$	2	$\frac{2}{x}$

Defining Equation: $\frac{2}{x-3} + \frac{2}{x} = 1$

$$x(x-3)\left[\frac{2}{x-3} + \frac{2}{x}\right] = x(x-3)(1)$$ Multiply x(x-3)

$$2x + 2x - 6 = x^2 - 3x$$

$$0 = x^2 - 7x + 6 \rightarrow 0 = (x-6)(x-1)$$

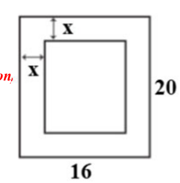
Therefore, either $x = 6$ or $x = 1$ BUT … if x = 1 then Computer B finishes 2 hours before it starts… Clearly we need to use $x = 6$!

It takes Computer A 3 hours and Computer B 6 hours to do the whole job.

Homework #5 Review

2.4 #4. Pg 128 "*A 16-inch by 20-inch mounting board is used to mount a photograph. How wide a uniform border is needed if the photograph occupies 3/5 of the area of the mounting board?*"

Inside dimensions: (16-2x) by (20-2x)
Total area = (16)(20); Inner area = (16-2x) (20-2x)



$$(16 - 2x)(20-2x) = \frac{3}{5}(16)(20)$$ *(defining equation)*

$$4(8-x)(10-x) = 192$$

$$(8-x)(10-x) = 48$$

$$80 - 18x + x^2 = 48$$

$$x^2 - 18x + 32 = 0$$

$$(x - 16)(x - 2) = 0$$

ROOTS: x = 16 or x = 2

If x = 16, the inside dimension becomes negative (16 – 2x = -16 and 20-2x = -12)

Thus the border (x) MUST equal 2 inches

Homework #5 Review

2.4 #5. **Pg 128** *"The length of a rectangle exceeds twice its width by 4 feet. If the area of the rectangle is 48 square feet, find the dimensions"*

Let Width = x

Let Length = 2x + 4

Defining Equation: $x(2x+4) = 48$

$2x^2 + 4x - 48 = 0$

$x^2 + 2x - 24 = 0$

$(x+6)(x-4) = 0$

Can't have x = - 6 feet, therefore:

$x = 4$

$2x + 4 = 12$

The width is 4 feet and the length is 12 feet

Homework #5 Review

2.4 #6. **Pg 128** *"The length of a rectangle is 4 centimeters less than twice its width. Find the dimensions if the area of the rectangle is 96 square centimeters"*

Let Width = x

Let Length = 2x – 4

Defining Equation: $x(2x-4) = 96$

$2x^2 - 4x - 96 = 0$

$x^2 - 2x - 48 = 0$

$(x-8)(x+6) = 0$

Can't have x = - 6 centimeters (cm), therefore:

$x = 8$

$2x - 4 = 12$

The width is 8 cm and the length is 12 cm

Homework #5 Review

2.4 #8. **Pg 128** *"The base of a triangle is 2 feet more than twice its altitude. If the area is 12 square feet, find the dimensions"*

Let Altitude = x

Let Base = 2x + 2

Defining Equation: $1/2\,(2x+2)(x) = 12$

$(x+1)(x) = 12$

$x^2 + x - 12 = 0$

$(x+4)(x-3) = 0$

Can't have x = - 4 feet therefore:

$x = 3$

$2x + 2 = 8$

The altitude is 3 feet and the base is 8 feet

Homework #5 Review

2.4 #11. **Pg 128** *"The sum of a number and its reciprocal is 26/5 – Find the number"*

Let the Number = x

Defining Equation: $x + \frac{1}{x} = \frac{26}{5}$

$5x^2 + 5 = 26x$

$5x^2 - 26x + 5 = 0$

$(5x-1)(x-5) = 0$

Therefore either x = 1/5 or x = 5

Not enough info here to decide which is best answer…

Homework #5 Review

2.4 #12. Pg 128 "The difference of a number and its reciprocal is 35/6 Find the number"

Let the Number = x

Defining Equation: $x - \frac{1}{x} = \frac{35}{6}$

$6x\left[x - \frac{1}{x}\right] = 6x\left(\frac{35}{6}\right)$

$6x^2 - 6 = 35x$

$6x^2 - 35x - 6 = 0$

$(6x+1)(x-6) = 0$

If x = -1/6 then 1/x = -6 and if x = 6 then 1/x = 1/6

Therefore either x = +/- 1/6 or x = +/-6

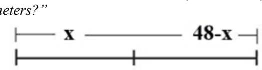
Not enough info here to decide which is best answer…

Homework #5 Review

2.4 #21. **Pg 128** *"A wire 48 centimeters long is cut into two pieces. Each piece is bent to form a square. Where should the wire be cut so that the sum of the areas of the squares is equal to 80 square centimeters?"*

1st square's side length = x/4

2nd square's side length = (48-x)/4



Defining Equation: $\left(\frac{x}{4}\right)^2 + \left(\frac{48-x}{4}\right)^2 = 80$

$\frac{x^2}{16} + \frac{2304 - 96x + x^2}{16} = 80$

$x^2 + x^2 - 96x + 2304 = 1280$

$2x^2 - 96x + 1024 = 0$

$x^2 - 48x + 512 = 0$

$(x-16)(x-32) = 0$

If x = 16 then 48 - x = 32 and if x = 32 then 48-x = 16

Same answer, therefore the wire needs to be cut 16 cm from either end.

Questions?

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In Chapter 6

6. Exponential and Logarithmic Functions
- **6.1 A Brief Review of Inverse Functions *(not reviewed)***
- **6.2 Exponential Functions**
- **6.3 Logarithmic Functions**
- **6.4 Fundamental Properties of Logarithms**
- **6.5 Exponential and Logarithmic Equations**
- **Exponential and Logarithmic Models**
- **Nonlinear Models**

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Chapter 6

Exponential and Logarithmic Models

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Exponential & Logarithm Models

There are many examples of exponential and logarithmic models in real life.

The five most common types of mathematical models involving exponential functions or logarithmic functions are listed below

1. **Exponential Growth model:** $y = ae^{bx}, b > 0$
2. **Exponential Decay model:** $y = ae^{-bx}, b > 0$
3. **Gaussian model:** $y = ae^{-(x-b)^2/c}$
4. **Logistic Growth model:** $y = \frac{a}{1 + be^{-rx}}$
5. **Logarithmic models:** $y = a + b \ln x, \; y = a + b \log_{10} x$

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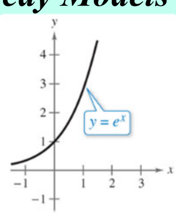
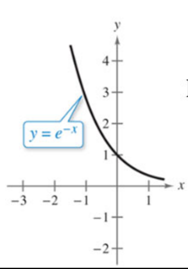
Exponential Growth & Decay Models

Exponential *Growth* model:

$y = ae^{bx}, b > 0$

For $y = e^x$





Exponential *Decay* model:

$y = ae^{-bx}, b > 0$

For $y = e^{-x}$

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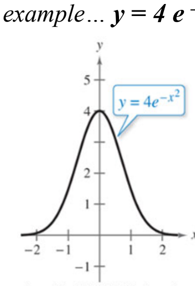
Gaussian Model

Gaussian model:

$y = ae^{\frac{-(x-b)^2}{c}}$

For example… $y = 4e^{-x^2}$



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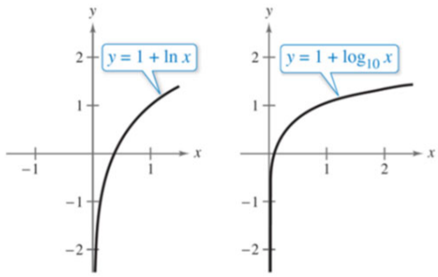
Logarithmic Models

***Natural* Log:** $y = a + b\ln x$ $\quad (y = 1 + \ln x)$

***Common* Log:** $y = a + b\log_{10} x$ $\quad (y = 1 + \log_{10} x)$

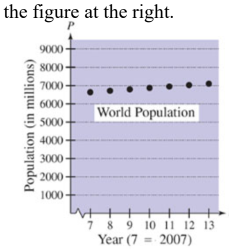


Exponential Growth & Decay

Demography: The table shows estimates of the world population (in millions) from 2007 through 2013.
A scatter plot of the data is shown in the figure at the right.
(Source: U.S. Census Bureau)

Year	Population, *P*
2007	6631
2008	6710
2009	6788
2010	6866
2011	6943
2012	7021
2013	7098

Spreadsheet at LarsonPrecalculus.com



An exponential growth model that approximates these data is given by $P = 6128e^{0.0113t}$ where P is the population (in millions) and $t = 7$ represents the year 2007.

Exponential Modeling

$$P = 6128e^{0.0113t}$$

where P is the population (in millions) and $t = 7$ represents the year 2007.

Compare the values given by the model with the estimates shown in the table:

Year	2007	2008	2009	2010	2011	2012	2013
Population	6631	6710	6788	6866	6943	7021	7098
Model	6632	6708	6784	6861	6939	7018	7098

According to this model, when will the world population reach 7.6 billion? Let $P = 7600$ in the model and solve for t.

Exponential Population Problem

$$P = 6128e^{0.0113t}$$

Let $P = 7600$ in the model and solve for t:

$6128e^{0.0113t} = P$	Write original equation.
$6128e^{0.0113t} = 7600$	Substitute 7600 for P.
$e^{0.0113t} \approx 1.24021$	Divide each side by 6128.
$\ln e^{0.0113t} \approx \ln 1.24021$	Take natural log of each side.
$0.0113t \approx 0.21528$	Inverse Property
$t \approx 19.1$	Divide each side by 0.0113.

Thus, according to the model, the world population will reach 7.6 billion in 2019. (Wikipedia indicates it took over 2 million years of human history for the world's population to reach 1 billion, and only 200 years more to reach 7 billion! As for the calculation… the population in 2018 was already 7,655,957,369 and it was 7.8 billion as of March 2020!)

Gaussian Models

As mentioned at the beginning of this section, Gaussian models are of the form $y = ae^{-(x-b)^2/c}$

This type of model is commonly used in probability and statistics to represent populations that are **normally distributed**. For *standard* normal distributions, the model takes the form

$$y = \frac{1}{\sqrt{2\pi}}e^{-x^2/2}$$

The graph of a Gaussian model is called a **bell-shaped** or a **standard normal distribution curve**.
The average value for a population can be found from the bell-shaped curve by observing where the maximum ***y*-value** of the function occurs.
The ***x*-value** corresponding to the maximum ***y*-value** of the function represents the average value of the independent variable—in this case, x.

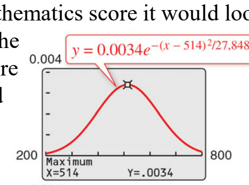
SAT Score Model

In 2013, the Scholastic Aptitude Test (SAT) mathematics scores for college-bound seniors roughly followed the normal distribution *(Source: College Board)*

$$y = 0.0034\,e^{-(x-514)^2/27{,}848}, \quad 200 \le x \le 800$$

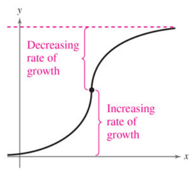
where x is the SAT score for mathematics. If we used a graphing utility to graph this function and estimate the average SAT mathematics score it would look like this:

We can see that the average math score for college bound seniors in 2013 was 514.



Logistic Growth Models

Some populations initially have rapid growth, followed by a declining rate of growth, as indicated here:



One model for describing this type of growth pattern is the **logistic** or **sigmoidal curve** given by

$$y = \frac{a}{1 + be^{-rx}}$$

where y is the population size and x is the time.

An example is a bacteria culture that is initially allowed to grow under ideal conditions, and then, as it depletes its food source with growing population of bacteria, it grows under less favorable conditions that inhibit growth.

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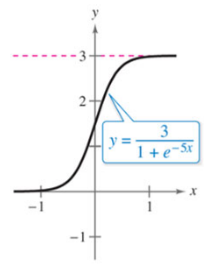
Logistic Growth Model

Logistic or Sigmoidal Curve Growth model:

$$y = \frac{a}{1+b\,e^{-rx}}$$



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Spread of a Virus

On a college campus of 5000 students, one student returns from vacation with a contagious flu virus. The spread of the virus is modeled by

$$y = \frac{5000}{1 + 4999e^{-0.8t}}, \quad t \geq 0$$

where y is the total number of students infected after t days. *The college announced that it will cancel classes when 40% or more of the students are infected.*

a. How many students are infected after 5 days?

b. After how many days will the college cancel classes?

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Spread of a Virus – 5 days

$$y = \frac{5000}{1 + 4999e^{-0.8t}}, \quad t \geq 0$$

a. After 5 days, the number of students infected is

$$y = \frac{5000}{1 + 4999e^{-0.8(5)}}$$

$$= \frac{5000}{1 + 4999e^{-4}}$$

≈ 54 students are infected after five days.

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Spread of a Virus – Cancelling classes

$$y = \frac{5000}{1 + 4999e^{-0.8t}}, \quad t \geq 0$$

b. Classes are canceled when the number of infected students is (0.40)(5000) = 2000.

$$2000 = \frac{5000}{1 + 4999e^{-0.8t}}$$

$$1 + 4999e^{-0.8t} = 2.5$$

$$e^{-0.8t} = \frac{1.5}{4999}$$

$$\ln e^{-0.8t} = \ln \frac{1.5}{4999}$$

$$-0.8t = \ln \frac{1.5}{4999}$$

$t = -\frac{1}{0.8} \ln \frac{1.5}{4999}$ *thus,* $t \approx 10.14$ days

Within 2 weeks(!) at least 40% of the students will be infected, and classes would have to be canceled.

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Logarithmic Models

On the **Richter Scale**, the magnitude R of an earthquake of intensity I is given by

$$R = \log_{10} \frac{I}{I_0}$$

where $I_0 = 1$ is the minimum intensity used for comparison. Intensity is a measure of the wave energy of an earthquake.

In 2014, Edgefield, South Carolina, experienced an earthquake that measured **4.1** on the Richter Scale.

Also in 2014, Nago, Japan, experienced an earthquake that measured **6.5** on the Richter Scale. *(Source: U.S. Geological Survey).*

a. Find the intensity of each earthquake.

b. Compare the two intensities.

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4.1 on the Richter Scale

Because $I_0 = 1$ and $R = 4.1$, the intensity of the earthquake in South Carolina can be found as shown:

$R = \log_{10} \frac{I}{I_0}$ Write original equation.

$4.1 = \log_{10} \frac{I}{1}$ Substitute 1 for I_0 and 4.1 for R.

$10^{4.1} = 10^{\log_{10} I}$ Exponentiate each side.

$10^{4.1} = I$ Inverse Property
[*NOTE:* $10^{\log_{10} I} = I$]

So, the intensity in South Carolina was about
$10^{4.1}$ ≈ an intensity of 12,589

6.5 on the Richter Scale

Because $I_0 = 1$ and $R = 6.5$, the intensity of the earthquake in Japan can be found as shown:

$R = \log_{10} \frac{I}{I_0}$ Write the original equation.

$6.5 = \log_{10} \frac{I}{1}$ Substitute 1 for I_0 and 6.5 for R.

$10^{6.5} = 10^{\log_{10} I}$ Exponentiate each side.

$10^{6.5} = I$ Inverse Property

The intensity was about **$10^{6.5}$ ≈ 3,162,278**. *An increase of **2.4 units on the Richter Scale** (from 4.1 to 6.5) **represents an increase in intensity by a factor of 251**!*

Chapter 6

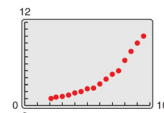
Nonlinear Models

Classifying Scatter Plots - 1

A scatter plot can be used to give you an idea of which type of model will best fit a set of data.

Decide whether the following set of data could best be modeled by a linear model, $y = ax + b$, an exponential model, $y = ab^x$, or a logarithmic model, $y = a + b \ln x$.

a. (2, 1), (2.5, 1.2), (3, 1.3), (3.5, 1.5), (4, 1.8), (4.5, 2), (5, 2.4), (5.5, 2.5), (6, 3.1), (6.5, 3.8), (7, 4.5), (7.5, 5), (8, 6.5), (8.5, 7.8), (9, 9), (9.5, 10)



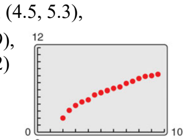
Solution:

a. From the figure, (bending UP) it appears that the data can best be modeled by an **exponential function**.

Classifying Scatter Plots - 2

Decide whether the following set of data could best be modeled by a linear model, $y = ax + b$, an exponential model, $y = ab^x$, or a logarithmic model, $y = a + b \ln x$.

b. (2, 2), (2.5, 3.1), (3, 3.8), (3.5, 4.3), (4, 4.6), (4.5, 5.3), (5, 5.6), (5.5, 5.9), (6, 6.2), (6.5, 6.4), (7, 6.9), (7.5, 7.2), (8, 7.6), (8.5, 7.9), (9, 8), (9.5, 8.2)



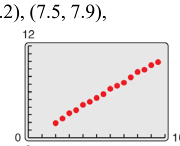
Solution:

b. From the figure, (bending away from **y = x**) it appears that the data can best be modeled by a **logarithmic function**.

Classifying Scatter Plots - 3

Decide whether the following set of data could best be modeled by a linear model, $y = ax + b$, an exponential model, $y = ab^x$, or a logarithmic model, $y = a + b \ln x$.

c. (2, 1.9), (2.5, 2.5), (3, 3.2), (3.5, 3.6), (4, 4.3), (4.5, 4.7), (5, 5.2), (5.5, 5.7), (6, 6.4), (6.5, 6.8), (7, 7.2), (7.5, 7.9), (8, 8.6), (8.5, 8.9), (9, 9.5), (9.5, 9.9)



Solution:

c. From the figure, it appears that the data can best be modeled by a straight line **linear function**.

Fitting Models to Data

Once you have used a scatter plot to determine the type of model that would best fit a set of data, there are several ways that you can actually find the model.

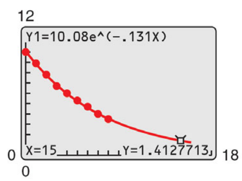
The table shows the amount ***y*** (in grams) of a radioactive substance remaining after ***x*** days. One can use a graphing utility to find a model for the data and also how much of the substance remains after **15 days**, etc.

Each method is best used with a computer or calculator regression program, rather than with hand calculations.

DATA

Day, *x*	Amount, *y*
0	10.0
1	8.9
2	7.8
3	6.7
4	6.0
5	5.3
6	4.7
7	4.0
8	3.5

Spreadsheet at LarsonPrecalculus.com



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Questions?

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About Exam #2 – Worth 20%

Exam #2 is a one hour exam with 20 @ 5 point questions that will be emailed after our Zoom Class on Monday 9 November (by 8:00pmET)

EXAM 2 is DUE ***by 11:00pm 9 November!***

HOW TO EMAIL ME YOUR EXAM:

1. You MUST use DARK BLACK pencil or pen on WHITE paper.

If I can't read your work you get a ZERO!

2. Please scan your work as a PDF and save it as lastname_E2.pdf

HOWEVER – IF YOU CAN NOT SCAN –

Fill out the docx file. Take a photo of any work unable to be 'typed out' and insert the photo(s) into the space allotted and save the file as: ***lastname_E2.docx*** *and attach the file* ***(NO CLOUD LINKS)***

Include the worked out problems AND solutions AND any units…

Email your file to me at: ***crubenst@pratt.edu***

With the Subject Line: ***Math150 Exam***

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Next Class Session #8

Class Sessions Posted Online Friday before Class

***In class* – Session 8: Monday 26 October:**

- ***DUE:*** ***Homework Set #07 by 12:00Noon 26 October!***
  NOTE: Quiz 7 = four problems from hwk
- ***Review: Homework Set #06; Textbook readings***
- ***Lecture: Trigonometric Functions***

***In class* – Session 9: Monday 2 November:**

- ***DUE:*** ***Homework Set #08 by 12:00Noon 2 November!***
  NOTE: Quiz 8 = four problems from hwk
- ***Review: Homework Set #07; Textbook readings***
- ***Lecture: Applications of Trigonometry***

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Any Questions?

Send me an email …

crubenst@pratt.edu

or

c.rubenstein@ieee.org

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End

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