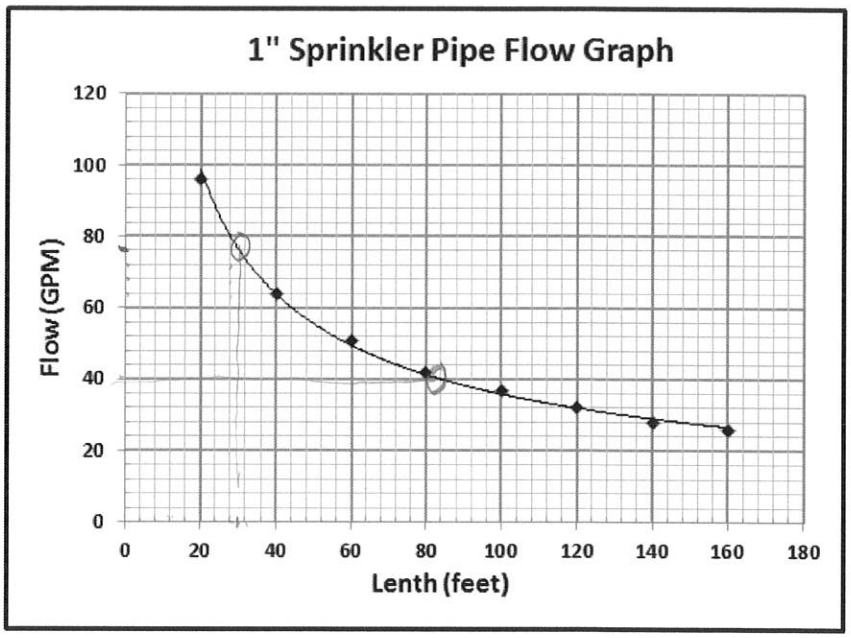
Mth 96 Chapter 3 Review

1. Consider the data and graph for the flow rate of water through a 1-inch pipe for different lengths of pipe.

Length (ft)	Flow (GPM)
20	96
40	64
60	51
80	42
100	37
120	32
140	28
160	26



a. Find the slope between the 20 and 40 foot pipes and explain its meaning in context in a complete sentence.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{64 - 96}{40 - 20} = \frac{-32}{20} = -1.6$ gpm

Between 20ft and 40ft pipe the flow goes down 1.6 gpm

b. Estimate the flow for a 30 foot pipe from the graph. Answer in a complete sentence.

≈ 74 gpm The flow for a 30 foot pipe is about 74 gpm

c. Estimate the length of a pipe with a flow of 40 GPM from the graph. Answer in a complete sentence.

≈ 82-84 ft For a flow of 40 GPM the pipe will be about 82 ft

d. Use regression to find a power equation to model the data. Round the numbers in your equation to 2 decimal places.

$a = 652.0395768$

$b = -0.6300512058$

$y = 652.04x^{-0.63}$

e. Use your equation to estimate the flow for a 30 foot pipe, compare your answer to (b).

Find y when $x = 30$

$y = 652.04(30)^{-0.63}$

$y = 76.504\,65275$ gpm

the flow rate for a 30 ft pipe is about 76.5 GPM which is pretty close to my estimate in b

f. Use your equation to estimate the length of pipe with a flow of 40 GPM, compare your answer to (c).

Find x when $y = 40$

$\frac{40}{652.04} = \frac{652.04\,x^{-0.63}}{652.04}$

$(0.061345929\,7) = \left(x^{-0.63}\right)^{\frac{1}{-0.63}}$

$x = 0.061345929\,7 \wedge (1 \div -0.63)$

$x = 83.974\,920\,06$ ft

For a flow rate of 40 gpm the pipe would be about 84 ft long which is close to my estimate in c

g. Use your equation to predict the flow for a 200 foot pipe.

Find y when $x = 200$

$y = 652.04(200)^{-0.63}$

$y = 23.153\,963\,35$ gpm

the flow rate for a 200 ft pipe is about 23 gpm

h. Use your equation to predict the length of pipe with a flow of 12 GPM.

Find x when $y = 12$

$\frac{12}{652.04} = \frac{652.04\,x^{-0.63}}{652.04}$

$(0.018\,403\,778\,9) = \left(x^{-0.63}\right)^{\frac{1}{-0.63}}$

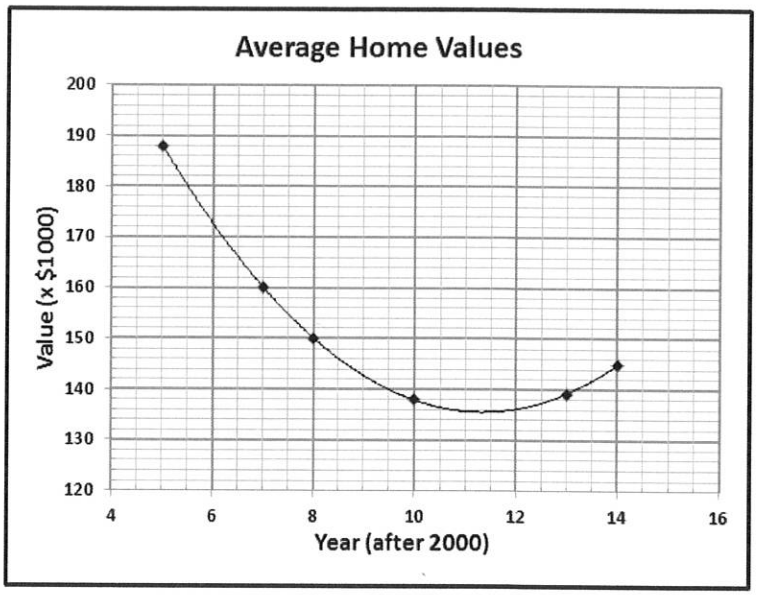
$0.018\,403\,778\,9 \wedge (1 \div -0.63)$

$x = 567.696\,035\,6$

For a 12 GPM flow rate the pipe is about 568 ft long.

2. Consider the data and graph for the average home value in Oregon over the past decade.

Year (after 2000)	Average Home Value
5	$188
7	$160
8	$150
10	$138
13	$139
14	$145



Quadratic Formula:

$ax^2+bx+c=0$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

Quad Reg

a. Use regression to find a quadratic equation to model the data. Round the numbers in your equation to 2 decimal places.

$y=ax^2+bx+c$

$a=1.309635417$
$b=-29.67057292$
$c=303.5854167$

$y=1.31x^2-29.67x+303.59$

b. Use the vertex formula ($x=\frac{-b}{2a}$) to find the minimum home value and the year it occurred.

$x=\frac{--29.67}{2(1.31)}$

$x=\frac{29.67}{2.62}$

$x=11.32442748$

$x=11.32$ year

2011.3

$y=1.31(11.32)^2-29.67(11.32)+303.59$

$y=135.5921144$

$y=\$135.59$

$\approx \$135,590$

The minimum home value is about $135,590 and occurs in 2011

c. Use your equation to predict the average home value in 2018.

Find y when $x = 18$

$2018 - 2000 = 18$

$y = 1.31(18)^2 - 29.67(18) + 303.59$

$y = \$193.97 \times 1000$

$\$193,970$

In 2018 the average home value is about $\$193,970$

d. Use your equation to predict the year the average value will reach $180,000 again.

Find x when $y = 180$

$180 = 1.31x^2 - 29.67x + 303.59$

$-180 \quad -180$

$1.31x^2 - 29.67x + 123.59 = 0$

$x = \dfrac{--29.67 \pm \sqrt{(-29.67)^2 - 4(1.31)(123.59)}}{2(1.31)}$

$x = \dfrac{29.67 \pm \sqrt{232.6973}}{2.62}$

$x = \dfrac{29.67 \pm 15.25441903}{2.62}$

$x = \dfrac{29.67 + 15.25441903}{2.62}$

$x \approx 17.14672482$

2017

$x = \dfrac{29.67 - 15.25441903}{2.62}$

$x = 5.502130141$

2005

The home value will reach 180,000 in 2017 and 2005

3. Simplify $2d^2f^3 \cdot 3d^0f^{-2}$

$6d^{2+0}f^{3+-2}$

$6d^2f$

Properties of Exponents

a&b are real numbers, m&n are integers

- **Product Property**: $a^m * a^n = a^{m+n}$
- **Quotient of Powers**: $\frac{a^m}{a^n} = a^{m-n}$; $a \neq 0$

Power of a Power Property: $(a^m)^n = a^{mn}$

- **Power of a Product Property**: $(ab)^m = a^m b^m$
- **Negative Exponent Property**: $a^{-m} = \frac{1}{a^m}$; $a \neq 0$
- **Zero Exponent Property**: $a^0 = 1$; $a \neq 0$
- **Power of Quotient**: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $b \neq 0$

4. Simplify $5x^2y^3z^{-5} \cdot 2xy^{-1}z^2$

$10x^{2+1}y^{3+-1}z^{-5+2}$

$10x^3y^2z^{-3} = \frac{10x^3y^2}{z^3}$

5. Simplify $\frac{3m^{-4}}{m^3}$

$3m^{-4-3} = 3m^{-7} = \frac{3}{m^7}$

6. Simplify $\frac{2m^2n^5}{4m^3n^4}$

$\frac{1m^{2-3}n^{5-4}}{2} = \frac{1m^{-1}n}{2} = \frac{1n}{2m}$

7. Simplify $\left(x^2y^{-1}\right)^3$

$x^{2\cdot3}\ y^{-1\cdot3} = x^{6}\ y^{-3}$

$= \dfrac{x^6}{y^3}$

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8. Simplify $\left(2a^{-5}b^3\right)^2$

$2^2\ a^{-5\cdot2}\ b^{3\cdot2}$

$4a^{-10}b^6 = \dfrac{4b^6}{a^{10}}$

9. Simplify $\dfrac{5p^2q^3r^5}{10p^4q^2r^3}$

$\dfrac{1\ p^{2-4}\ q^{3-2}\ r^{5-3}}{2} = \dfrac{1\ p^{-2}\ q\ r^2}{2} = \dfrac{1qr^2}{2p^2}$

10. Simplify $\dfrac{4x^0y^{-2}z^3}{4x^2yz^{-5}}$

$x^{0-2}\ y^{-2-1}\ z^{3--5}$

$x^{-2}\ y^{-3}\ z^{8}$ $\qquad \dfrac{z^8}{x^2y^3}$