

Quiz tomorrow

- Trends in graphs
- Rate of change
- Linear model
- Quadratic model
- Exponential model

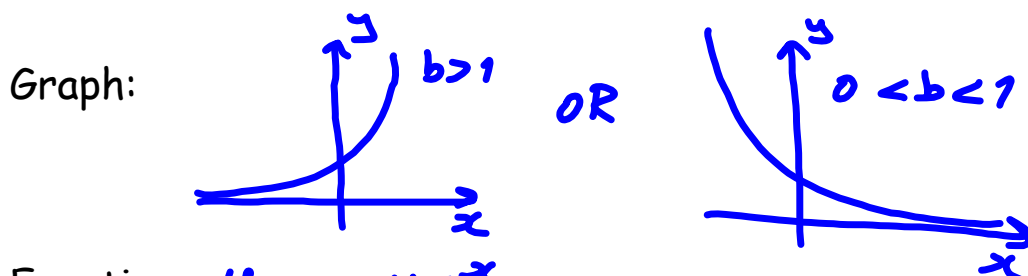
Be able to determine each model given a table of values, graph or an equation.

Exponential Models

All mathematical models can be represented using: tables, equations and/or graphs.

What are the identifying features of an exponential?

Table: *The ratios of the consecutive y-values are equal ($y_2 \div y_1, y_3 \div y_2, \text{etc.}$)*



Equation: $y = a(b)^x$
a - initial/starting amount
b - growth/decay
x - time

Given a set of data an exponential regression can be performed to determine if the best model for the data is exponential.

Linear models

- change at a constant rate
- a fixed amount is added to the quantity at regular intervals

Exponential models

- change at a constant percent rate
- the quantity is multiplied by a fixed amount at regular intervals

Investigation p. 310

Suppose you are offered a choice of jobs.

- Job A pays \$10/h with a \$1/h raise every year.
- Job B pays \$10/h with a 10% raise every year.
- How would your wages grow under each job over 5 years?

Organize your work in a table.

- Would you prefer to have Job A or Job B? Explain your reasoning.

Year	Job A (\$)	Job B (\$)
0	10	10
1	11	11
2	12	12.10
3	13	13.31
4	14	14.64
5	15	16.11

$$100\% + 10\% = 110\% \text{ or } 1.10$$

∴ We would prefer job B since we would have more money per hour (\$16.11 per hour)

1. A population grows by each percent per year.
By what factor is each year's population multiplied?

a) 3%

b) 5%

c) 12%

$100\% + 3\% = 103\%$
 $\boxed{1.03}$

$\boxed{1.05}$

$\boxed{1.12}$

3. Which tables of values model an exponential relation?

How do you know?

a)

<i>t</i>	0	1	2	3	4	5
<i>A</i>	400	420	441	463	486.2	510.5

<i>t</i>	<i>A</i>	Ratio
0	400	$420 \div 400 = 1.05$
1	420	$441 \div 420 = 1.05$
2	441	$463 \div 441 = 1.049886$
3	463	$486.2 \div 463 \stackrel{\approx 1.05}{=} 1.0501$
4	486.2	$510.5 \div 486.2 \stackrel{\approx 1.05}{=} 1.049979$
5	510.5	$\stackrel{\approx 1.05}{=} 1.05$

\therefore This table of values models an exponential relation since the ratios are constant.

b)

<i>d</i>	0	1	2	3	4	5
<i>P</i>	100	82	67	55	45	37

Ratio	$\frac{82}{100} = 0.82$	$\frac{67}{82} = 0.82$	$\frac{55}{67} = 0.82$	$\frac{45}{55} = 0.82$	$\frac{37}{45} = 0.82$
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\therefore This table of values models an exponential relation since the ratios are equal.

5. Which equations model an exponential relation? How do you know?

a) $y = 2 + 4x$

b) $y = 2 + 4x^2$

c) $y = 2(4)^x$

Linear
 $y = mx + b$

Quadratic
 $y = ax^2 + bx + c$

Exponential
 $y = a \times (b)^x$

11. This table shows the growth in cell phone subscribers for a particular company.

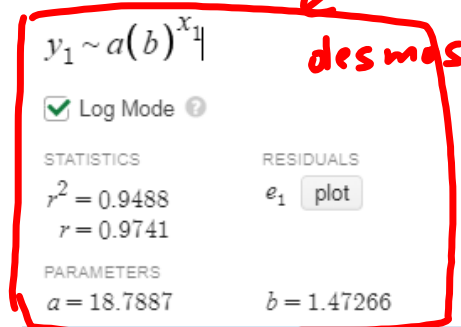
Year	2000	2001	2002	2003	2004
Number of subscribers (thousands)	15.9	33.8	43.9	55.3	86.1

- a) Determine the exponential relation $y = ab^x$ that best fits the data, where x is the number of years since 2000 and y is the number of cell phone subscribers in thousands.
- b) What do the values of a and b represent in this situation? Explain.

Ans:

a) $y = a b^x$

$y = 18.7887 \times (1.47266)^x$



b) $a = 18.8$, $b = 1.47266$

a - represents the starting number of subscribers

b - represents the grow factor

$1.47266 - 1 = 0.47266$ or 47.3%

(The number of subscriber increases by) 47.3% every year

Homework: Pg. 315: #1-10