Date:_____ Name: _____

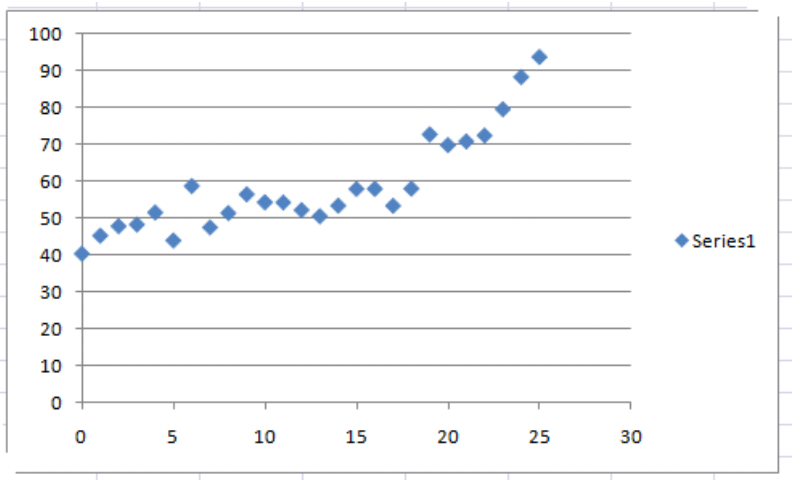
Using Excel to model Gas Prices - BONUS

Year	Years since 1981	Price (cents/L)
1981	0	40.5
1982	1	45.4
1983	2	47.95
1984	3	48.4
1985	4	51.65
1986	5	44.1
1987	6	48.8
1988	7	47.6
1989	8	51.5
1990	9	56.55
1991	10	54.4
1992	11	54.35
1993	12	52.3

Year	Years since 1981	Price (cents/L)
1994	13	50.65
1995	14	53.5
1996	15	58.0
1997	16	58.05
1998	17	53.45
1999	18	58.1
2000	19	72.75
2001	20	69.85
2002	21	70.85
2003	22	72.45
2004	23	79.55
2005	24	88.25
2006	25	93.65

1. Open Excel: Start, Programs, Excel

2. Enter the data given.
3. Select the data values for year and price and create a scatter plot.



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4. Click on any data point. Then do Right click and pop up menu will appear. Select **Add Trendline , then s**elect Trend/Regression **type**. ☆

5. Find Options Tab. Check " **Display Equation on Chart** " and " **Display R-squared value on chart** "
   Note the closer R-squared value is to 1, the better the model is to the data given.

☆ Try different Regression types:

6. **LINEAR**
   Record the equation y = _____ and R^2= _____

7. **EXPONENTIAL**
   Record the equation y = _____ and R^2= _____

8. **QUADRATIC**
   Record the equation y = _____ and R^2= _____

9. **CUBIC**
   Record the equation y = _____ and R^2= _____

10. Use all the models to predict the gas price in the year 1999 and 2015.

11. Based on the results discuss the usefulness of mathematical models to interpolate versus extrapolate values. Discuss why this is so.

Date:_____ Name: _____

Using Fathom to model a Bungee Jump - BONUS

The height versus time data of a bungee jumper are given in the table, for the first half minute or so of his jump. Heights are referenced to the rest position of the bungee jumper, which is well above ground level.

Time(s)	0	1	2	3	4	5	6	7	8	9	10	11	12
Height(m)	100	90	72	45	14	-15	-41	-61	-71	-73	-66	-52	-32
Time(s)	13	14	15	16	17	18	19	20	21	22	23	24	25
Height(m)	-11	11	30	44	53	54	48	37	23	6	-8	-23	-33
Time(s)	26	27	28	29	30	31	32	33	34	35	36	37	
Height(m)	-39	-39	-35	-27	-16	-4	6	17	24	28	29	26	

1. Open Fathom: Start, Programs, Fathom
2. Drag a collection  into the workspace.
3. Double click on the box (not the name of it) and enter the following information

Cases	Measures	Comments	Display

Attribute	Value	Formula
time_s		
Height_m		
<new>		

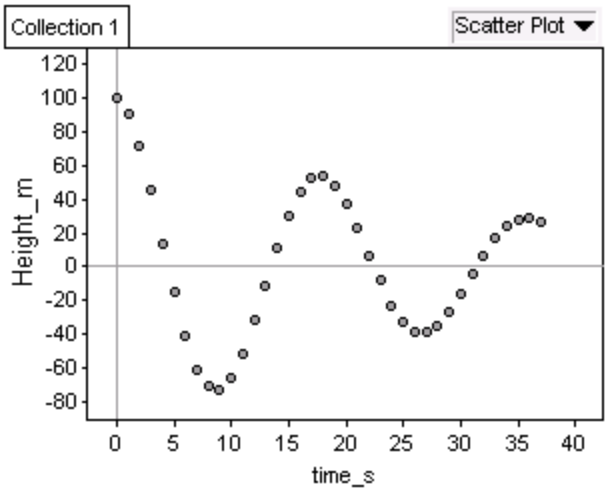
4. Drag a table  into the workspace.
5. Enter the values from the table above like shown

Collection 1

	time_s	Height_m	<new>
1	0	100	
2	1	90	
3	2	72	
4	3	45	
5	4	14	
6	5	-15	
7	6	-41	
8	7	-61	
9	8	-71	

Drag a graph  into the workspace.

6. Select the time column and drag it onto the x-axis of the graph. Then select the height column and drag it into the y-axis of the graph to get this result:



7. Describe how the graph exhibits sinusoidal features.

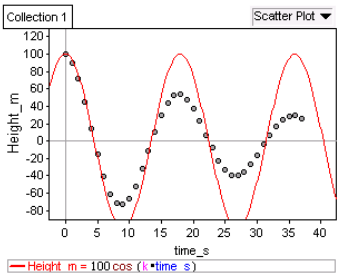
8. Describe how the graph exhibits exponential features.

Date:_____ Name: _____

Constructing a Cosine Function:

9. Drag a slider into the workspace. Rename it *k*. Click on the graph. From the **Graph** menu, choose **Plot Function**. Enter the function 100*cos(*k****time_s**) Adjust the slider until the crests and troughs of the function occur at the same time values on the scatter plot.

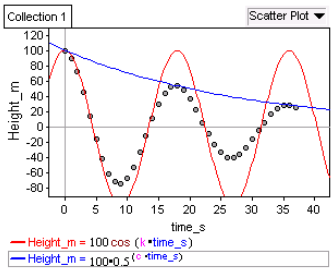
The value of *k is* _____



Constructing an Exponential Function

10. Repeat the steps used for cosine function with a new slider called *c*, and new equation 100*0.5^(*c****time_s**). Adjust the slider so that the graph of exponential touches each crest of the scatter plot.

The value of *c* is _____

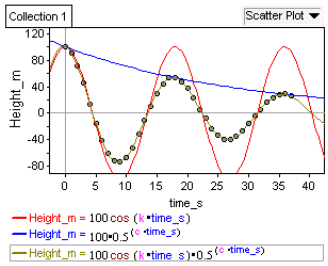


Construct a Combined function

11. Click on the graph. From the **Graph** menu, choose **Plot Function**. Enter the function 100*cos(*k****time_s**)* 0.5^(*c****time_s**). Adjust the values of *k* and *c* if needed.

The final value of *k* is _____

The final value of *c* is _____



12. How far will the bungee jumper be above the rest position at his fourth crest?

13. For how long will the bungee jumper bounce before his amplitude has diminished to 10m?

14. What is the significance of the factor of 100?

15. Why was a cosine function chosen instead of a sine function?

16. When the cosine function and the exponential function are combined, only one factor of 100 is used. Why?

17. When is the magnitude of the rate of change of this function the greatest? What does this mean from a physical perspective?

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Find Applications of Functions & Compare to Polynomials - BONUS

Note to students: *See the rubric below for the criteria.*

Be prepared to discuss the following with your teacher and peers.

1. *In this course, you had the opportunity to investigate several different types of functions: Polynomial, Rational, Exponential, Logarithmic and Trigonometric. Select one* ***non-polynomial*** *function, exponential, trigonometric, or another type, and use your favourite search engine to hunt for an application – something that is a part of 'real life' – of your family of functions. Use a search phrase like "Interesting Exponential Functions" or one of your own invention.*
2. *Find a site that you think is interesting. Explore it.*
3. *Record:*
    - *The search engine you used, and the search phrase you used.*
    - *The URL you found.*
    - *A brief description of the contents of the site, and your reasons for choosing this site.*
    - *A description of the key features of your chosen function and a comparison to the key features you've learned about of polynomial functions.*
4. *Share your site with one of your classmates. Check out your classmates' site.*

Date:_____ Name: _____

Rubric

Activity 2: Identifying a Variety of Functions Graphically

Categories	Level 1 (50 - 59%)	Level 2 (60 - 69%)	Level 3 (70 - 79%)	Level 4 (80 - 100%)
Knowledge/Understanding: distinguish polynomial functions from sinusoidal and exponential functions. PO1.04.	Distinguishes polynomial functions from sinusoidal and exponential functions with limited accuracy.	Distinguishes polynomial functions from sinusoidal and exponential functions with some accuracy.	Distinguishes polynomial functions from sinusoidal and exponential functions with considerable accuracy.	Distinguishes polynomial functions from sinusoidal and exponential functions with a high degree of accuracy.
Communication: compare the graphs of various polynomial functions with the graphs of other types of functions. PO1.04.	Compares the graphs of various polynomial functions with the graphs of other types of functions with limited relevance.	Compares the graphs of various polynomial functions with the graphs of other types of functions with some relevance.	Compares the graphs of various polynomial functions with the graphs of other types of functions with considerable relevance.	Compares the graphs of various polynomial functions with the graphs of other types of functions with a high degree of relevance.
Application: describe key features of the graphs of polynomial functions. PO1.03.	Describes a few key features of the graphs of polynomial functions.	Describes some key features of the graphs of polynomial functions.	Describes most key features of the graphs of polynomial functions.	Describes almost all key features of the graphs of polynomial functions.

Note: A student whose achievement is below Level 1 (50%) has not met the expectations for this assignment or activity.