

Introduction to Engineering Microsoft Excel 3

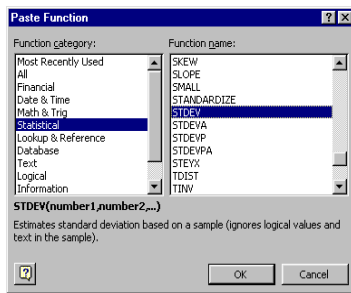
Agenda

- Formulas
- Excel Function Library

Formulas and the Excel Function Library

- Formulas are used to calculate values in a cell in the worksheet based on values stored in other cells and/or using the Excel function library.
- Start by selecting a cell and typing =
- Click **Insert...Function** to access the function library
- Use proper cell referencing

Insert...Function



The Excel function library contains hundreds of built-in functions. Clicking Insert...Function opens the dialog box shown here, which allows you to select the function you need and to see how to use it.

Retrieve Walnut Student Body Data

- Use formulas to calculate:
 - Minimum
 - Maximum
 - Mean Average
 - Standard Deviation
- Explore the:
 - Formula Bar (& editing)
 - Function Library
 - Fill Handle

GRADE	# of MALE	# of FEMALE	TOTAL
7	146	155	301
8	104	137	241
9	169	192	361
10	146	171	317
11	142	184	326
12	122	185	307
totals	829	1024	1853

Excel 3 Homework #1

- Use the **average**, **standard deviation**, **min**, and **max**, functions from the Excel Function Library on the Birth and Death Columns of Excel 1.
- The result of each function should begin a new row in the table.

Number of Births and Deaths in the United States

Year	Births	Deaths
1976	3,167,788	1,909,440
1980	3,612,258	1,989,841
1982	3,680,537	1,974,797
1984	3,669,141	2,039,369
1986	3,756,547	2,105,361
1988	3,909,510	2,167,999
1990	4,158,212	2,148,463
1991	4,110,907	2,169,518
1992	4,065,014	2,175,613
1993	4,000,240	2,268,553
1994	3,952,767	2,278,994

Cell Referencing

- The dollar sign (\$) is used in cell references to control what happens when you use the fill handle to copy a formula over a range of rows and/or columns.

B12 - relative reference to value in B12
 \$\$B\$12- absolute reference to value in B12

Let's Graph:

$$y = -16x^2 + 80x + 3$$

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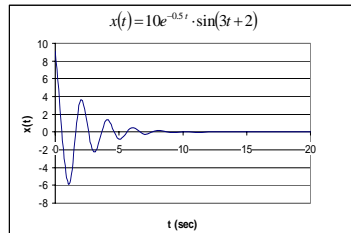
Excel 3 Homework #2

Create an Excel worksheet to plot the following function over the range $0 \leq t \leq 20$ seconds as a scatter plot at 1 second intervals.

$$x(t) = 10e^{-0.5t} \cdot \sin(3t + 2)$$

*Expected result is given to the right

•Print data & graph



Excel 3 Homework #3

Cables are used to suspend bridge decks and other structures. If a heavy uniform cable hangs suspended from its two endpoints, it takes the shape of a catenary curve whose equation is

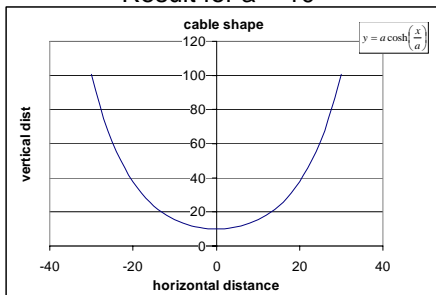
$$y = a \cdot \cosh\left(\frac{x}{a}\right)$$

where a is the height of the lowest point on the chain above some horizontal reference line, x is the horizontal coordinate in reference to this lowest point, and y is the vertical coordinate.

Use cell \$ \$ reference for the different values of a . Use Excel to create the plot for $-30 \leq x \leq 30$ when $a = 10, 15,$ and 25 . (sample answers for $a = 10$ & $a = 25$ are provided) PROVIDE DATA AND THE 3 GRAPHS

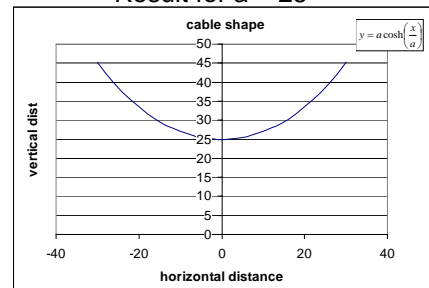
Expected Results homework #3

Result for $a = 10$



Expected Results homework #3

Result for $a = 25$



BONUS to Excel 3

Engineers often work with processes that exhibit oscillatory behavior. Mathematically, these are described by equations that contain sine or cosine functions. Create an Excel worksheet for plotting

$$y(t) = A \sin(2\omega t) + r(n)$$

where A is the amplitude of the function (a constant), ω is a constant that determines the frequency of the oscillations, and $r(n)$ is a random number between 0 and n , included to simulate "noise" that is often observed in real systems. Your worksheet should allow the user to input values of A , ω , and n and observe the resulting scatter plot of $y(t)$ vs. t , for a range of t values from 0 to 20. Submit a hard copy of a graph with $A = 4$, $\omega = 0.5$, and $n = 2.5$. Also submit a copy of the worksheet and a copy of the formulas printed in the cells.

