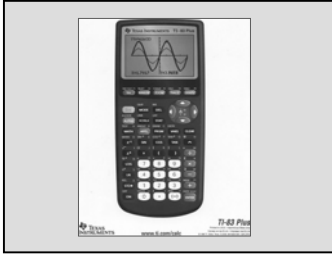


## Using a Graphing Utility



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1



## Using a Graphing Utility

### Graphing by Point plotting

- Must use **many** points to get an accurate picture.
- Could be **very time** consuming!



2



First, let's plot some points...



3



First, let's plot some points...

to graph: 
$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$

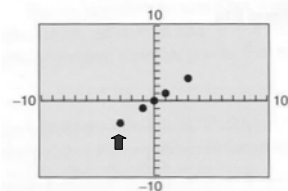


4



## Using a Graphing Utility

(-3, 3)



$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



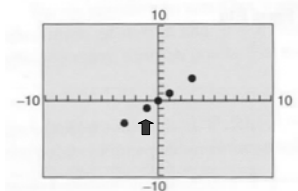
5



## Using a Graphing Utility

(-3, 3)

(-1, -1)



$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$

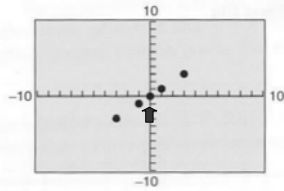


6



### Using a Graphing Utility

- (-3,3)
- (-1,-1)
- (0,0)

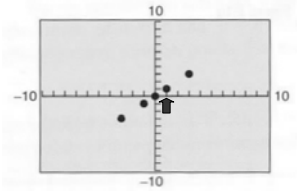


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

- (-3,3)
- (-1,-1)
- (0,0)
- (1,1)

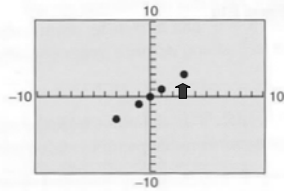


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

- (-3,3)
- (-1,-1)
- (0,0)
- (1,1)
- (3,3)

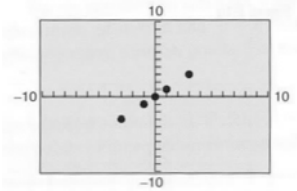


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

- (-3,3)
- (-1,-1)
- (0,0)
- (1,1)
- (3,3)

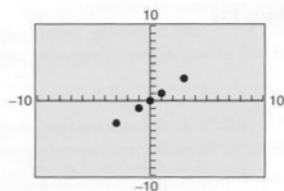


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

So, what is the graph shape?

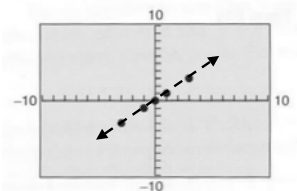


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

Looks like a straight line...



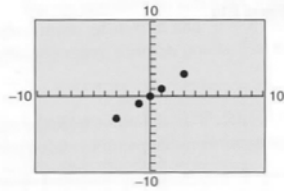
$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$





### Using a Graphing Utility

Let's plot a few more points...

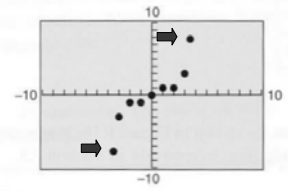


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

Notice now the new shape...

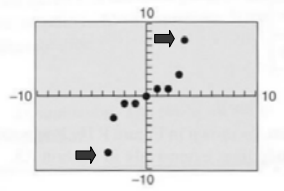


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

**Not** a straight line



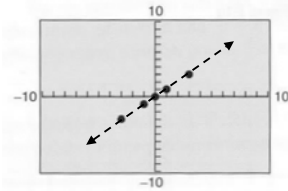
$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility



**Math Alert:**  
Limited point plotting can yield a limited graph!

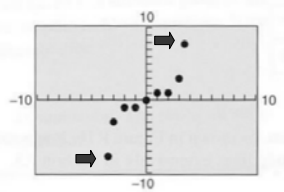


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

Plotting more points can be time consuming!

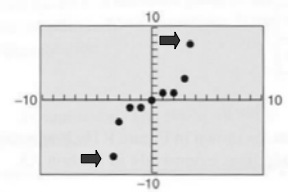


$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$



### Using a Graphing Utility

Technology can help--- plotting many, many points quickly.



$$y = \frac{1}{30}x(x^4 - 10x^2 + 39)$$





## Using a Graphing Utility

**To graph an equation involving  $x$  and  $y$  using a graphing utility:**

- 1.) Rewrite the equation so  $y$  is isolated on the left side.
- 2.) Enter the found equation in  $Y=$  in a graphing utility.
- 3.) Determine a viewing window showing all important features of a graph.
- 4.) Graph the equation.



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## Using a Graphing Utility

Let's try a little graphing utility practice for:  $2y + x^3 = 4x$



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## Using a Graphing Utility

Isolate or solve for  $y$  on the left side

$$2y + x^3 = 4x$$



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## Using a Graphing Utility

Subtract  $x^3$  from both sides

$$\begin{array}{r}
 2y + x^3 = 4x \\
 \underline{-x^3 \quad -x^3} \\
 \hline
 \end{array}$$



22



## Using a Graphing Utility

Divide each side of the top equation by 2.

$$\begin{aligned}
 2y &= -x^3 + 4x \\
 y &= -\frac{1}{2}x^3 + 2x
 \end{aligned}$$



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## Using a Graphing Utility

Put the solved equation into the graphing utility ( $Y=$ ) and graph

$$y = -\frac{1}{2}x^3 + 2x$$

in the standard viewing window--ZOOM 6



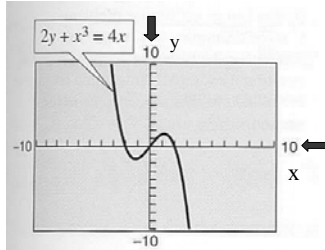
24



## Using a Graphing Utility

This is called the **standard viewing window**. (ZOOM 6)

The **maximum** and **minimum** of both **x** and **y** is **10**.



$$y = -\frac{1}{2}x^3 + 2x$$



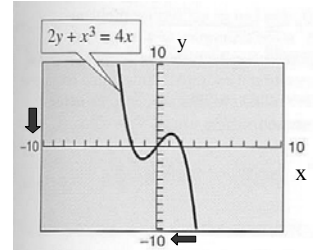
25



## Using a Graphing Utility

This is called the **standard viewing window**. (ZOOM 6)

The **maximum** and **minimum** of both **x** and **y** is **10**.



$$y = -\frac{1}{2}x^3 + 2x$$



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## Using a Graphing Utility

Does the chosen viewing window show the important features of the graph?



27



## Using a Graphing Utility

What are the important features of a graph?

- basic shape of the graph
- relative maximum(s) and or minimum(s)
- x and y intercepts



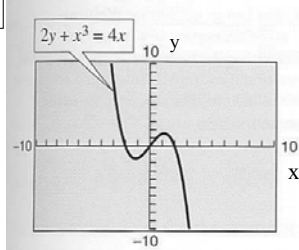
28



## Using a Graphing Utility

Important features of graph

Show basic shape?



$$y = -\frac{1}{2}x^3 + 2x$$



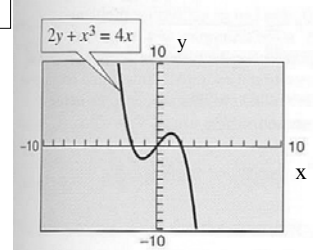
29



## Using a Graphing Utility

Important features of graph

Basic shape?  
---yes,  
reflected S



$$y = -\frac{1}{2}x^3 + 2x$$



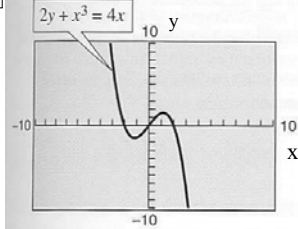
30



## Using a Graphing Utility

Important features of graph

Show relative maximum and/or minimum?



$$y = -\frac{1}{2}x^3 + 2x$$



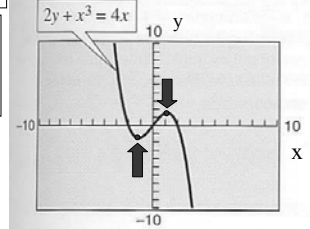
31



## Using a Graphing Utility

Important features of graph

Relative maximum and minimum?  
---yes



$$y = -\frac{1}{2}x^3 + 2x$$



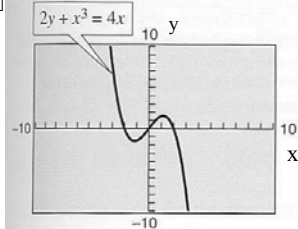
32



## Using a Graphing Utility

Important features of graph

Show x and y intercepts?



$$y = -\frac{1}{2}x^3 + 2x$$



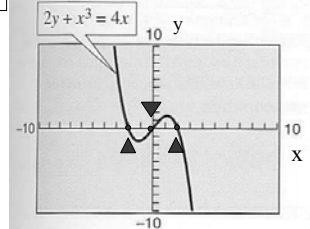
33



## Using a Graphing Utility

Important features of graph

x and y intercepts?  
---yes



$$y = -\frac{1}{2}x^3 + 2x$$

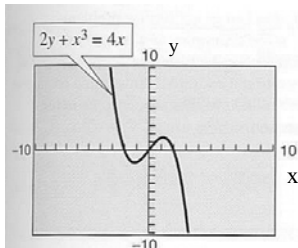


34



## Using a Graphing Utility

So, the **standard viewing window** is a good choice



$$y = -\frac{1}{2}x^3 + 2x$$

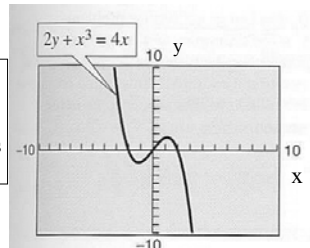


35



## Using a Graphing Utility

Very different impressions of a graph can be found by looking at different viewing windows



$$y = -\frac{1}{2}x^3 + 2x$$

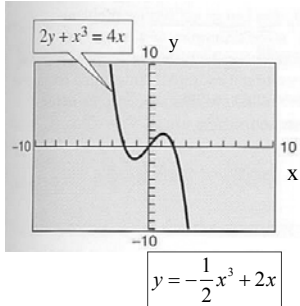


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## Using a Graphing Utility

Picking an **appropriate viewing window** in using a graphing utility is the same as using enough points in point plotting to see **all** the important features of the graph.



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## Using a Graphing Utility

Think of the graphing utility like a camera....

Just like a camera a graphing utility can **ZOOM** in and **ZOOM** out



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## Using a Graphing Utility



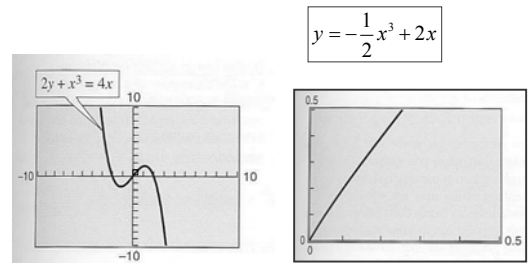
**Math Alert:**  
Notice how the changing the standard viewing window "changes" the graph.



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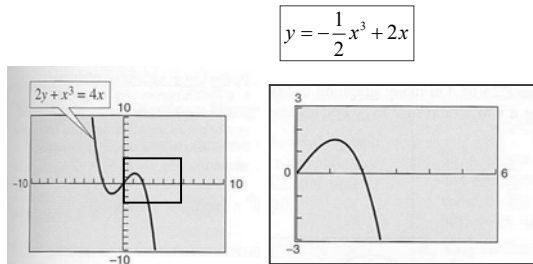
## Using a Graphing Utility



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## Using a Graphing Utility

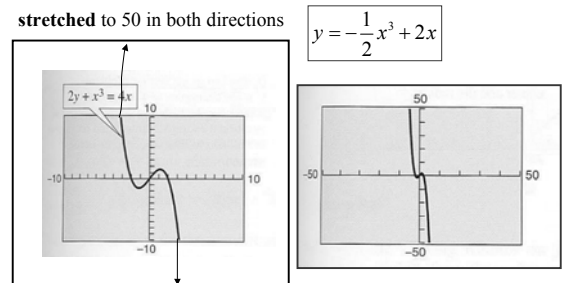


41



## Using a Graphing Utility

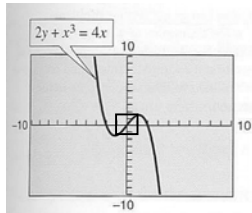
stretched to 50 in both directions



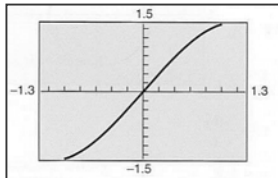
42



## Using a Graphing Utility



$$y = -\frac{1}{2}x^3 + 2x$$



43



## Using a Graphing Utility

Remember...



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## Using a Graphing Utility

**To graph an equation involving  $x$  and  $y$ :**

- 1.) Rewrite the equation so  $y$  is isolated on the left side.
- 2.) Enter the found equation in  $Y =$  in a graphing utility.
- 3.) Determine a viewing window showing all important features of a graph.
- 4.) Graph the equation.



45



## Using a Graphing Utility

You should have a basic idea about what the graph looks like before you put the solved equation into  $Y =$



46



## Using a Graphing Utility

What are the important features of a graph?

- basic shape of the graph
- relative maximum(s) and or minimum(s)
- $x$  and  $y$  intercepts



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## Using a Graphing Utility

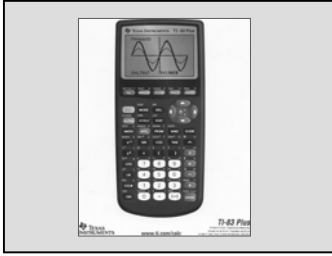


Math Alert:  
The graphing calculator should be a tool not a crutch !!!



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## Using a Graphing Utility



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# You can do this!

