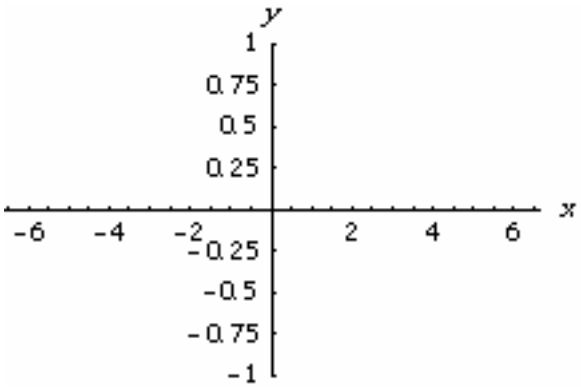
Assignment 4: Trigonometry and Exponentials (0.4&5) **Name**_____
Please provide a handwritten response.

1a. In *Mathematica*, $\sin x$ is expressed as **`Sin[x]`** , and the constant $\pi \approx 3.14$ is denoted by **`Pi`** . We can plot the sine function over the domain $-2\pi \le x \le 2\pi$ using the command

```
Plot[Sin[x], {x, -2Pi, 2Pi}]
```

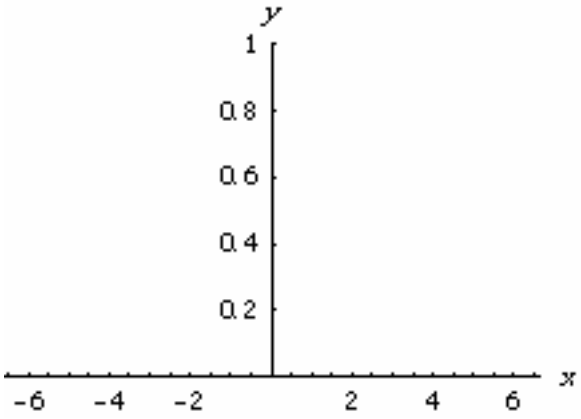
Execute this command and sketch the result on the axes at right.



1b. More complicated trigonometric functions can also be used, but they are not always written in *Mathematica* as they would be in traditional mathematical notation. For example, the function $y = \sin^2 x$ would be plotted over the domain $-2\pi \le x \le 2\pi$ using the command

```
Plot[Sin[x]^2,{x, -2Pi, 2Pi}]
```

(Note where the exponent goes!) Execute this command and sketch the result on the axes at right.



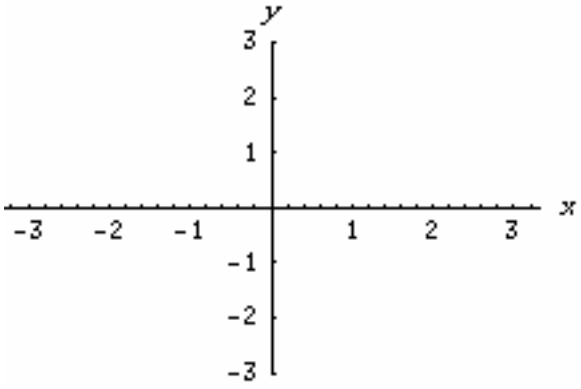
1c. The cosine function $\cos x$ is represented in *Mathematica* by **`Cos[x]`** , and the tangent function $\tan x$ by **`Tan[x]`** . So, the function $f(x) = \cos 5x + 3\sin 5x$, for example, would be represented by

```
f[x_] = Cos[5x] + 3Sin[5x]
```

Execute this command followed by

```
Plot[f[x], {x, -Pi, Pi}]
```

and sketch the result on the axes at right.



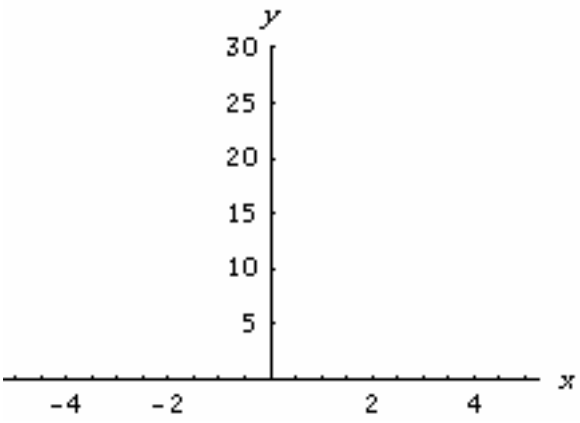
1d. All six trigonometric functions in *Mathematica* assume that the variable is measured in radians, not degrees. Execute the commands **`Sin[Pi/2]`** , **`Cos[Pi/4]`** , and **`Tan[-Pi/3]`** , and record the results below; were the answers what you would expect?

2. The **`Degree`** constant can be used to express degree measure. For example, execute the command **`Sin[60 Degree]`** to find $\sin 60^\circ$; is the result correct?

3a. Exponential functions in *Mathematica* are expressed using the **`^`** symbol just like any other exponent. For example, the function $y = 2^x$ appearing in Example 5.3 would be plotted over the domain $-5 \le x \le 5$ using the command

```
Plot[2^x, {x, -5, 5}]
```

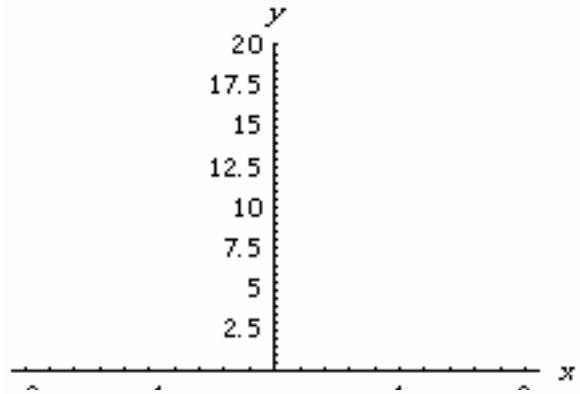
Execute this command, sketch the result on the axes at right and tell how it compares with Figure 0.69a.



3b. The special constant $e \approx 2.7$ is represented in *Mathematica* by **`E`** , and the function e^x is represented either by **`E^x`** or by **`Exp[x]`** ; for example, to graph $f(x) = 10e^{-x/3}$ in Exercise 26, Section 0.5 of the text, execute the command

```
Plot[10Exp[-x/3], {x, -2, 2}]
```

and sketch the result on the axes at right.



4. In *Mathematica* the natural logarithm function $\ln x$ is represented by **`Log[x]`** , whereas the logarithm $\log_b x$ of x with base b is denoted by **`Log[b, x]`** . (The **`b`** comes first!) Execute the command

```
Plot[{Log[x],Log[.5,x]},{x,0,4}
]
```

to plot the functions $\ln x$ and $\log_{1/2} x$ together on the same axes, and sketch the result on the axes at right. Label which graph is which.