Mathematica Assignment E
Logarithmic and Exponential Functions

The *Mathematica* command **Log[x]** gives the natural logarithm of x, $\ln(x)$. If you want the logarithm base b of x, $\log_b(x)$, use the command **Log[b, x]**. Since **Log[18]**, for example, is an exact number, *Mathematica* leaves it in that form unless you ask for a numerical approximation using the **N[ ]** command.

```
Log[18]
```

```
Log[18]
```

```
N[%]
```

```
2.89037
```

```
Log[2, 8]
```

```
3
```

The capital letter **E** is *Mathematica*'s notation for the number e. It is also an exact number. The symbol for e on the **BasicMathInput** palette is $\mathbb{e}$.

```
E
```

$\mathbb{e}$

```
N[%]
```

```
2.71828
```

```
E^3
```

$\mathbb{e}^3$

```
N[%]
```

```
20.0855
```

Mathematica commands using tranditional mathematical symbols can be found on the **BasicMathInput** palette. Click on the $\sqrt[\square]{\square}$ button. Type in 8, hit the [Tab] key, type in 3, hit the [→] key, then evaluate the resulting command. The output tells you that the cube root of 8 is 2. In general, the [Tab] key moves you between boxes, while the [→] key moves you outside all the boxes.

```
∛8
```

```
2
```

```
∛7
```

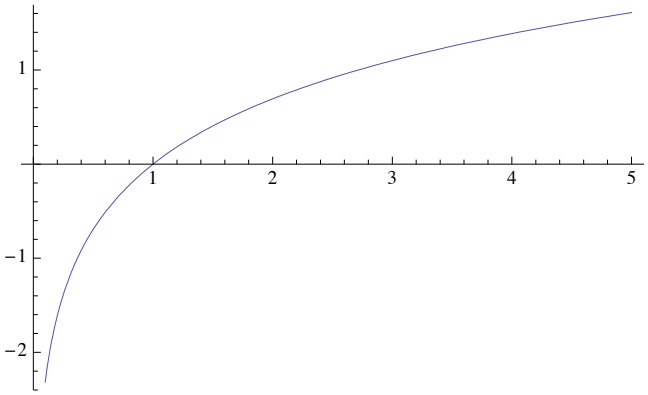
$7^{1/3}$

```
N[%]
```

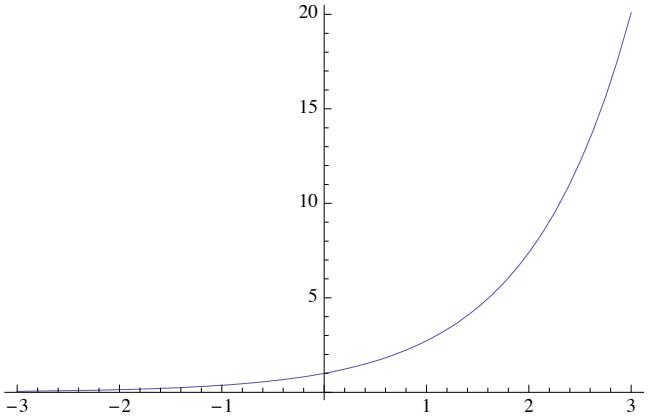
```
1.91293
```

You can graph exponential and logarithmic functions using the **Plot[ ]** command.

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

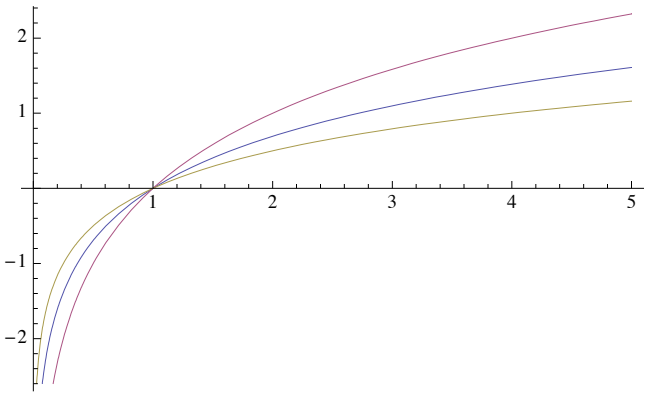



```
Plot[e^x, {x, -3, 3}]
```



You can graph more than one curve on the same set of axes as shown in the following example:

```
Plot[{Log[x], Log[2, x], Log[4, x]}, {x, 0, 5}]
```



Exercises

1. Compute numerical approximations for the following:
   a) ln(7)
   b) ln(1.5)
   c) $\log_2(16)$
   d) $\log_3(81)$

2. Compute numerical approximations for the following:
   a) e^7
   b) e^{-7}
   c) e^e
   d) $\ln(e^2)$
   e) $e^{\ln(4)}$
   f) $e^{\ln(e)}$

3. Plot the following curves for the given values of x:
   a) $y = \ln(\frac{1}{x}), 0 \le x \le 5$
   b) $y = \ln(x), 0 \le x \le 5$
   c) $y = \ln(\frac{x}{2}), 0 \le x \le 5$
   d) $y = e^{\frac{x}{2}}, -2 \le x \le 4$
   e) $y = -e^{-x}, -2 \le x \le 4$