

Exploring Stirling's Approximation

```
In[15]:= str[n_] := n^n Exp[-n] Sqrt[2 π n]
```

```
In[16]:= N[50!, 10]
```

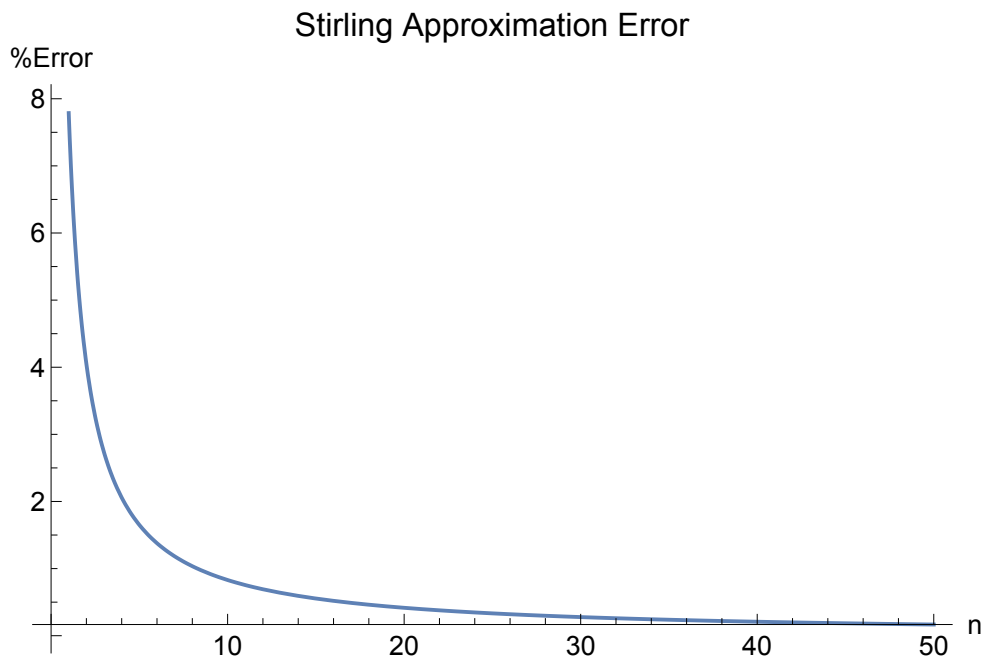
```
Out[16]= 3.041409320 × 1064
```

```
In[17]:= N[str[50], 10]
```

```
Out[17]= 3.036344594 × 1064
```

```
In[32]:= Plot[100*(1 - str[n]/n!), {n, 1, 50}, PlotRange → All,  
  AxesLabel → {"n", "%Error"}, LabelStyle → Larger,  
  PlotLabel → "Stirling Approximation Error", ImageSize → Scaled[0.8]]
```

```
Out[32]=
```



Logarithmic approximation

```
In[25]:= lnstr[n_] := n Log[n] - n
```

```
In[26]:= N[Log[50!], 10]
```

```
Out[26]= 148.4777670
```

```
In[27]:= N[lnstr[50], 10]
```

```
Out[27]= 145.6011503
```

```
In[31]:= Plot[100 * (1 - lnstr[n] / Log[n!]), {n, 2, 50}, PlotRange -> All,  
  AxesLabel -> {"n", "% Error"}, PlotLabel -> "Error in Logarithmic Approximation",  
  LabelStyle -> Larger, ImageSize -> Scaled[0.8]]
```

Out[31]=

