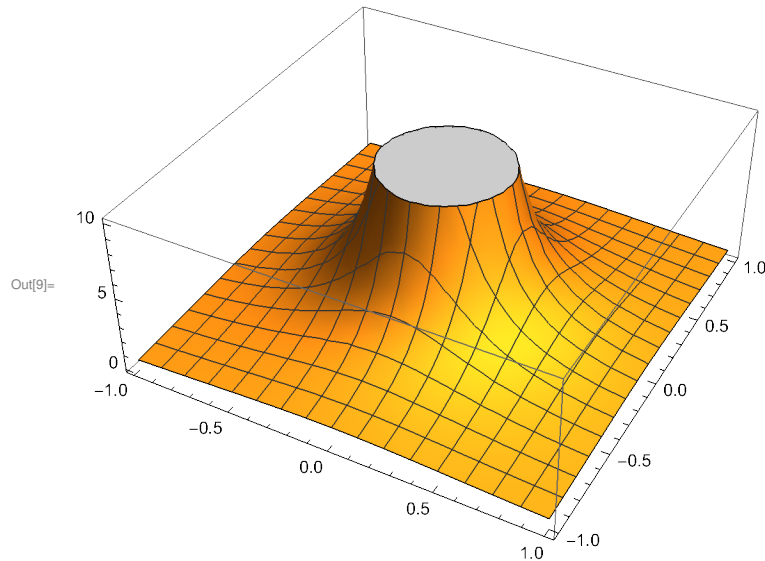

Resonance Plot :

```
In[10]:= Clear["Global`*"]
```

```
In[9]:= Plot3D[ $\frac{1}{x^2 + y^2}$ , {x, -1, 1}, {y, -1, 1}]
```



RLC Circuit :

1) Consider a circuit with a resistor (R), capacitor (C), or inductor (L), and this is driven by an AC source: $V \sin[\omega t]$. (If you prefer, you can use an exponential form.) For an RLC circuit with $R=20$ ohms, $C=10\mu\text{F}$, $L=100\text{mH}$, and $V=100$ volts plot the current as a function of ω .

- Find the maximum value of the current.
- Also, find the values of ω where the current is $\frac{1}{2}$ the maximum value.
- Overlay plots for $R=20, 10, 5$ ohms and comment.
- Is there a value of ω that will make the current go to infinity???

```
In[11]:= Clear["Global`*"]
```

```
In[12]:= xr = r;
```

$$xc = \frac{1}{\omega c};$$

$$xL = \omega L;$$

$$z = \sqrt{xr^2 + (xL - xc)^2}$$

Out[15]=

$$\sqrt{r^2 + \left(-\frac{1}{c \omega} + L \omega\right)^2}$$

```
In[27]:= wsol = Solve[D[z^2, w] == 0, w] // Last
```

```
Out[27]= {w -> \frac{1}{\sqrt{c} \sqrt{L}}}
```

```
In[24]:= values = {c -> 10 \times 10^{-6}, L -> 100 \times 10^{-3}, v -> 100};
```

```
current = \frac{v}{z}
```

```
Out[25]= \frac{v}{\sqrt{r^2 + \left(-\frac{1}{c w} + L w\right)^2}}
```

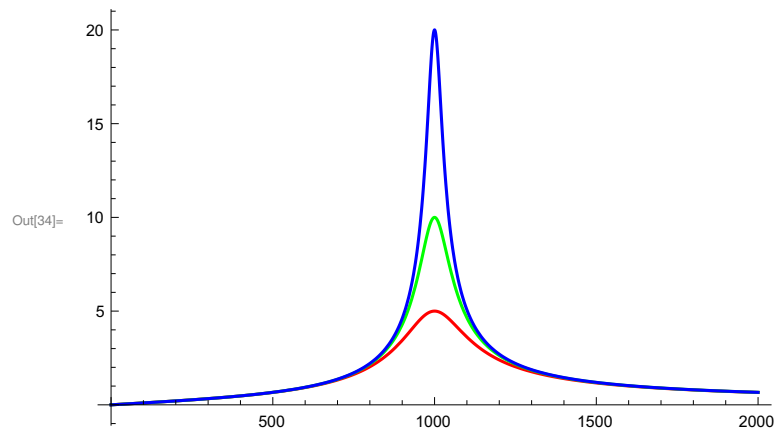
```
In[29]:= w0 = w /. wsol /. values
```

```
Out[29]= 1000
```

```
In[32]:= current /. values /. {r -> 20, w -> w0}
```

```
Out[32]= 5
```

```
In[34]:= Plot[current /. values /. {r -> {20, 10, 5}} // Evaluate, {w, 0, 2000},
PlotStyle -> {Red, Green, Blue},
PlotRange -> All]
```



Find w at half max

```
In[39]:= equation = current == \frac{5}{2} /. values /. {r -> 20}
```

```
Out[39]= \frac{100}{\sqrt{400 + \left(-\frac{100000}{w} + \frac{w}{10}\right)^2}} == \frac{5}{2}
```

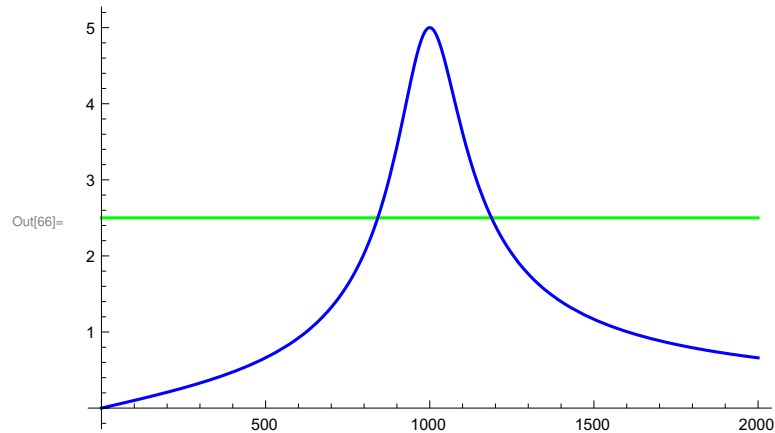
```
In[41]:= half = NSolve[equation, w]
```

```
Out[41]= {{w -> -1188.09}, {w -> 1188.09}, {w -> 841.684}, {w -> -841.684}}
```

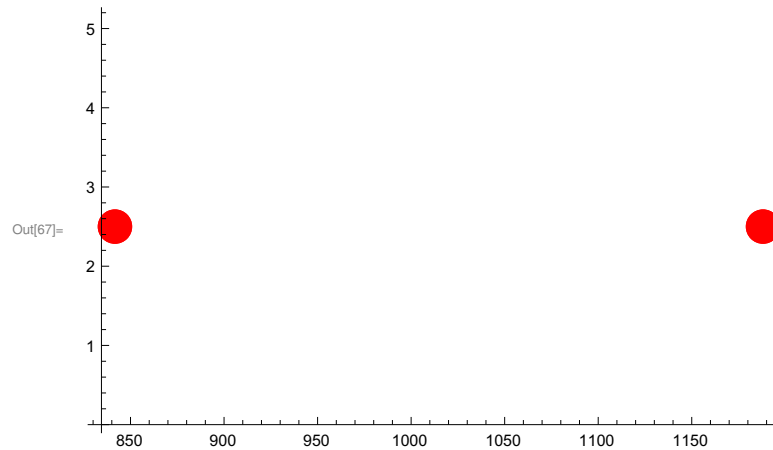
```
In[50]:= points = {#,  $\frac{5}{2}$ } & /@ (w /. half) // Abs
```

```
Out[50]:= {{1188.09,  $\frac{5}{2}$ }, {1188.09,  $\frac{5}{2}$ }, {841.684,  $\frac{5}{2}$ }, {841.684,  $\frac{5}{2}$ }}
```

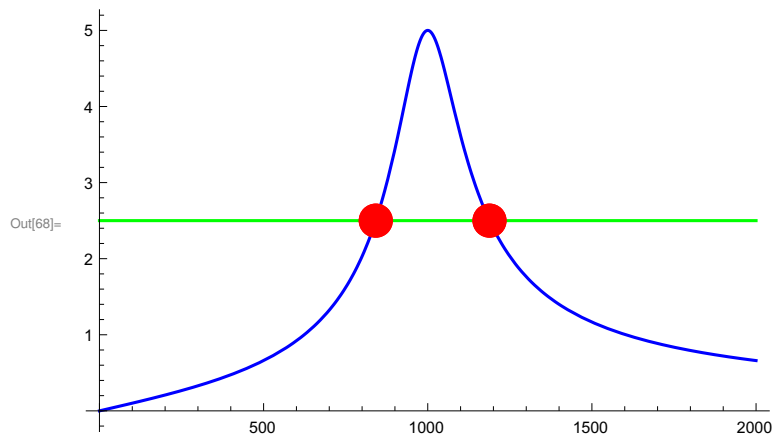
```
In[66]:= p1 = Plot[ $\left\{\frac{5}{2}, \text{current}\right\}$  /. values /. {r -> {20}} // Evaluate, {w, 0, 2000},  
PlotStyle -> {Green, Blue},  
PlotRange -> All]
```



```
In[67]:= p2 = ListPlot[points, PlotStyle -> {Red, PointSize[0.05]}]
```



In[68]:= Show[p1, p2]



In[61]:= ? Epilog

Out[61]=

Symbol i	
System`Epilog	
Documentation	Local » Web »
Attributes	{Protected }
Full Name	System`Epilog