Ionization Cross Section

In[1]:=
```
Q[U_] = Log[U] / (U^m El^2)
```

Out[1]=
$$\frac{U^{-m}\,\text{Log}[U]}{El^2}$$

In[11]:=
```
U[E0_] = E0 / El
```

Out[11]=
$$\frac{E0}{El}$$

Compute relative to E0

In[12]:=
```
Simplify[D[Q[U[E0]], E0]]
```

Out[12]=
$$\frac{\left(\frac{E0}{El}\right)^{-1-m}\left(1 - m\,\text{Log}\left[\frac{E0}{El}\right]\right)}{El^3}$$

In[15]:=
```
Simplify[D[Q[U[E0]], E0] == (1 - m Log[U[E0]]) / (U[E0]^(1+m) El^3)]
```

Out[15]=
```
True
```

Reexpress the derivative wrt m

In[4]:=
```
Simplify[D[Q[U], m] == -Q[U] Log[U]]
```

Out[4]=
```
True
```

In[5]:=
```
Plot[{Q[U] /. {m → 0.84, El → 6},
  Q[U] /. {m → 0.86, El → 6}, Q[U] /. {m → 0.88, El → 6}}, {U, 1, 5}]
```

Out[5]=