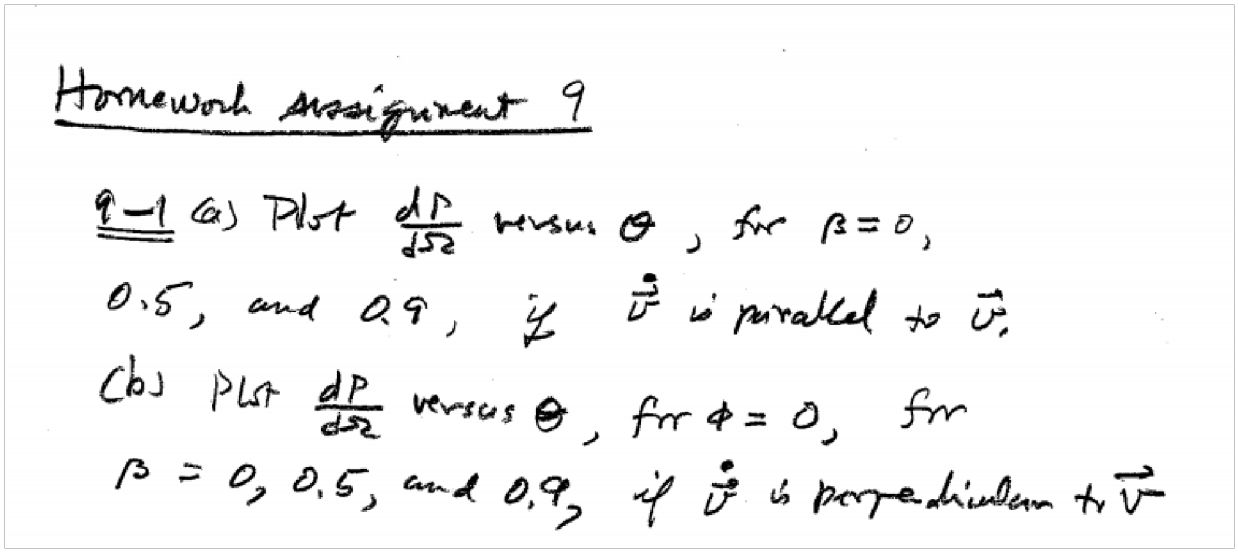
H. Assignment #9 Problem 9-1

In[1284]:=
```
Show[Import["9-1.png", "png"], ImageSize → 640]
```

Out[1284]=

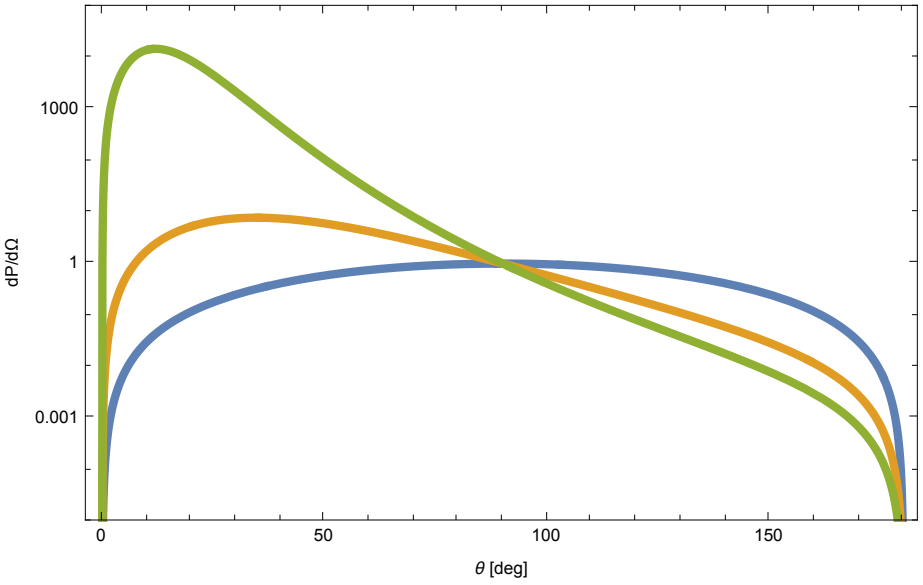


Part (a); use EQ (11.161)

In[1489]:=
```
Remove[β, α, f, f1]
f = Sin[θ]^2 / (1 - β * Cos[θ])^6
f1[β_, α_] = f /. {θ → α / 180 * Pi};
LogPlot[{f1[0, α], f1[0.5, α], f1[0.9, α]}, {α, 0, 180},
 PlotRange → {All, {1*^-5, 1*^5}}, Frame → True,
 FrameLabel → {"θ [deg]", "dP/dΩ"},
 PlotStyle → Thickness[0.01], ImageSize → 480]
```

Out[1490]=
$$\frac{\text{Sin}[\theta]^2}{(1-\beta\,\text{Cos}[\theta])^6}$$

Out[1492]=

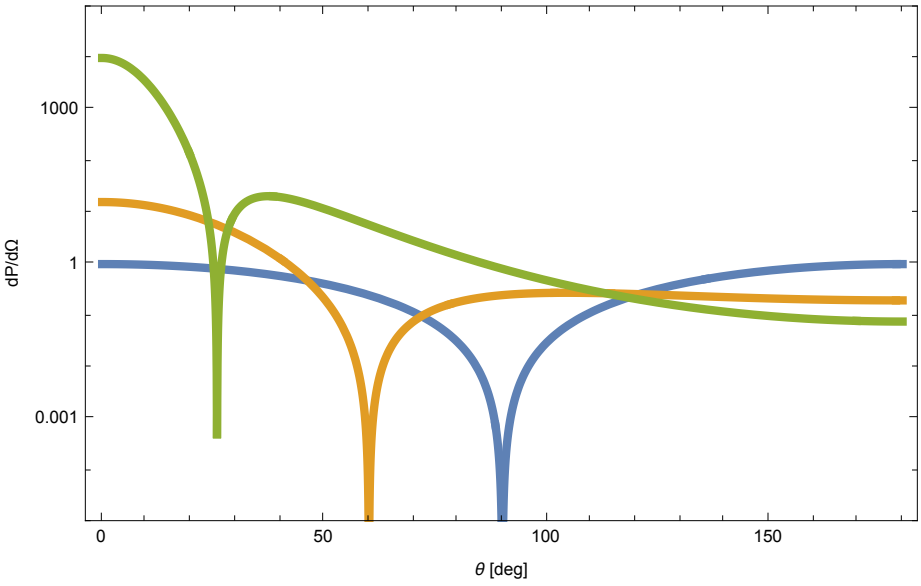


Part (b); use EQ (11.168) with $\phi = 0$

In[1497]:=
```
Remove[β, α, g, g1]
g = ( (1 - β * Cos[θ]) ^ 2 - (1 - β ^ 2) * Sin[θ] ^ 2 ) *
   Power[1 - β * Cos[θ], -6]
g1[β_, α_] = g /. {θ → α / 180 * Pi};
LogPlot[{g1[0, α], g1[0.5, α], g1[0.9, α]}, {α, 0, 180},
 PlotRange → {All, {1*^-5, 1*^5}}, Frame → True,
 FrameLabel → {"θ [deg]", "dP/dΩ"},
 PlotStyle → Thickness[0.01], ImageSize → 480]
```

Out[1498]=
$$\frac{(1-\beta\,\text{Cos}[\theta])^2-\left(1-\beta^2\right)\,\text{Sin}[\theta]^2}{(1-\beta\,\text{Cos}[\theta])^6}$$

Out[1500]=

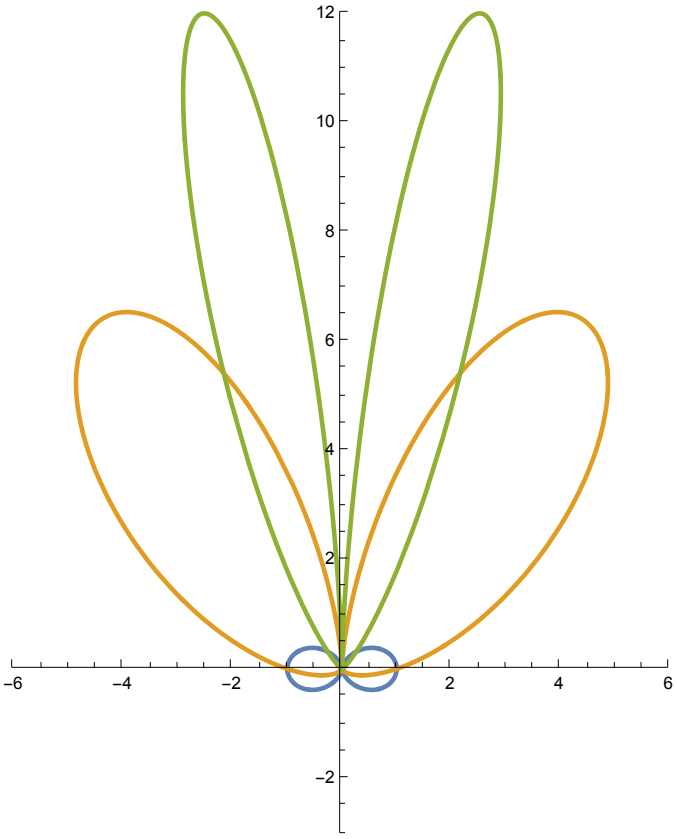


Polar plots

```
(* a parallel v *)
r[β_, α_] = f1[β, α]
ParametricPlot[
 {{r[0., α] * Sin[α / 180 * Pi], r[0., α] * Cos[α / 180 * Pi]},
  {r[0.5, α] * Sin[α / 180 * Pi], r[0.5, α] * Cos[α / 180 * Pi]},
  {r[0.9, α] / 1200 * Sin[α / 180 * Pi], r[0.9, α] / 1200 * Cos[α / 180 * Pi]}},
 {α, 0, 360}, PlotStyle → Thickness[0.007],
 PlotRange → {{-6, 6}, {-3, 12}}, AspectRatio → 15 / 12]
```

Out[1545]=
$$\frac{\text{Sin}\left[\frac{\pi\,\alpha}{180}\right]^2}{\left(1-\beta\,\text{Cos}\left[\frac{\pi\,\alpha}{180}\right]\right)^6}$$

Out[1546]=



In[1549]:=
```
(* a perp v *)
r[β_, α_] = g1[β, α]
ParametricPlot[
 {{r[0., α] * Sin[α / 180 * Pi], r[0., α] * Cos[α / 180 * Pi]},
  {r[0.5, α] / 5 * Sin[α / 180 * Pi], r[0.5, α] / 5 * Cos[α / 180 * Pi]},
  {r[0.9, α] / 1000 * Sin[α / 180 * Pi], r[0.9, α] / 1000 * Cos[α / 180 * Pi]}},
 {α, 0, 360}, PlotStyle → Thickness[0.007],
 PlotRange → {{-2, 2}, {-3, 12}}, AspectRatio → 1]
```

Out[1549]=
$$\frac{\left(1-\beta \operatorname{Cos}\left[\frac{\pi \alpha}{180}\right]\right)^2-\left(1-\beta^2\right) \operatorname{Sin}\left[\frac{\pi \alpha}{180}\right]^2}{\left(1-\beta \operatorname{Cos}\left[\frac{\pi \alpha}{180}\right]\right)^6}$$

Out[1550]=