#LAMIN JAMMEH
#EE597
#HW11

#Pr 18.2 (Complex potential)

```
restart;
```

```
F := arcsin(z);
```

$$F := \arcsin(z) \tag{1}$$

```
z := x + I·y;
```

$$z := x + \mathrm{I}\,y \tag{2}$$

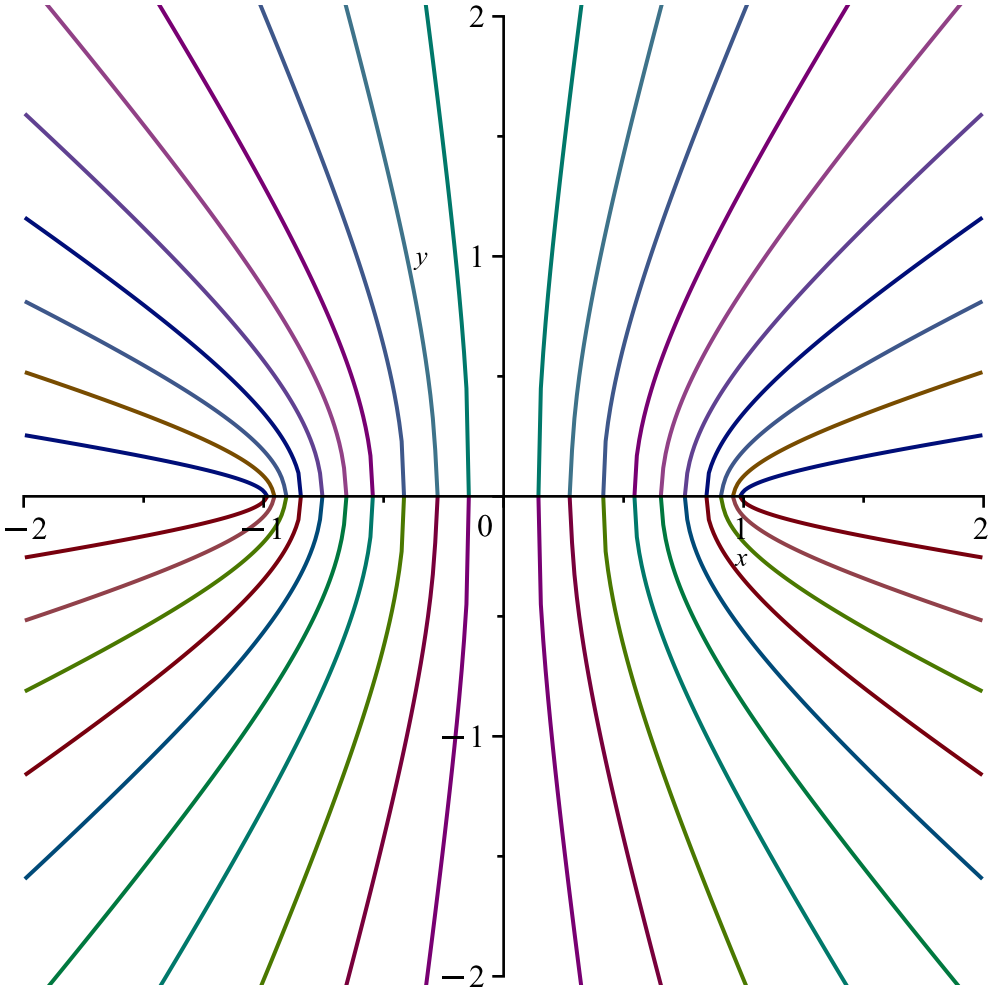
```
phi := evalc(Re(F));
```

$$\phi := -\arcsin\left(-\frac{\sqrt{(x+1)^2+y^2}}{2} + \frac{\sqrt{(x-1)^2+y^2}}{2} \right) \tag{3}$$

```
y := solve(phi = k, y);
```

$$y := -\frac{\sqrt{\cos(k)^2 x^2 + \sin(k)^4 + \cos(k)^2 - 1}}{\sin(k)}, \frac{\sqrt{\cos(k)^2 x^2 + \sin(k)^4 + \cos(k)^2 - 1}}{\sin(k)} \tag{4}$$

```
S := seq(y, k = 1 ..10) :
y :='y':
plot([S], x = -2 ..2, y = -2 ..2, scaling = constrained);
```



#Pr 18.5 (Pair of opposite electrical charges)

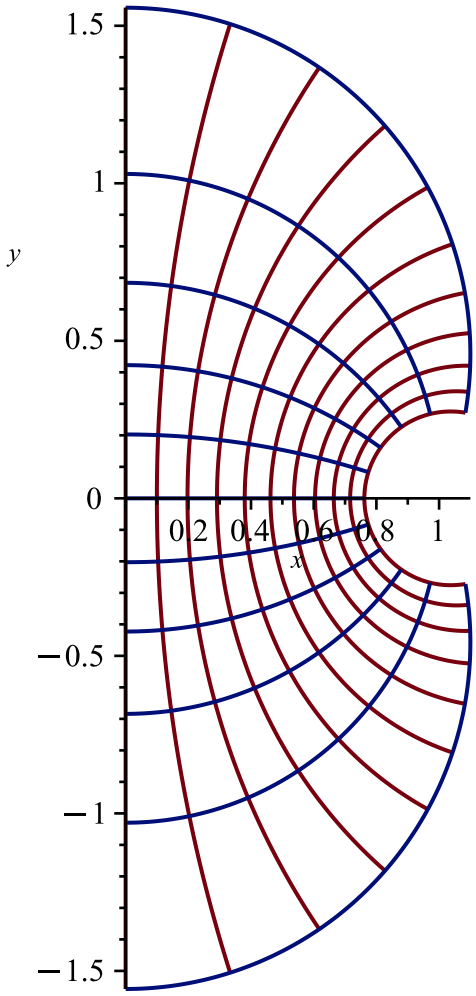
```
restart;
F := ln( -(z+1)/(z-1) );
```

$$F := \ln\left(-\frac{z+1}{z-1}\right) \tag{5}$$

```
w := solve(F=k, z);
```

$$w := \frac{e^{k}-1}{e^{k}+1} \tag{6}$$

```
with(plots):
conformal(w, k=-2*I..2+2*I, scaling=constrained, labels=[x,y]);
```



#Pr 18.6 (Arbitrary cylinder

```
restart;
z := r·exp(I· theta);
```

$$z := r\,e^{I\theta} \tag{7}$$

```
radius := 2
```

$$radius := 2 \tag{8}$$

```
F := z + (radius)^2/z;
```

$$F := r\,e^{I\theta} + \frac{4}{r\,e^{I\theta}} \tag{9}$$

```
psi := simplify(evalc(Im(F)));
```

$$\psi := \frac{\sin(\theta)\,(r^2-4)}{r} \tag{10}$$

```
sol := solve(psi = K/3, r);
```

$$sol := \frac{K+\sqrt{K^2+144\sin(\theta)^2}}{6\sin(\theta)}, \frac{K-\sqrt{K^2+144\sin(\theta)^2}}{6\sin(\theta)} \tag{11}$$

```
S1 := seq([sol[1], theta, theta = 0.001 ..Pi - 0.001], K = 0 ..20) :
S2 := seq([sol[2], theta, theta = 0.001 ..Pi - 0.001], K = -20 ..0) :
with(plots) :
P1 := plot([S1], -9 ..9, -4 ..4, coords = polar, color = black) :
 P2 := plot([S2], -9 ..9, -4 ..4, coords = polar, color = black) :
display(P1, P2, scaling = constrained);
```