```
Integrate[(Sin[x])^(1000), {x, 0, π}] // N
```

0.0792467

```
Gamma[1/2 - 5]
```

$$-\frac{32\sqrt{\pi}}{945}$$

```
Cot[0]
```

ComplexInfinity

```
Assuming[Abs[Sin[θ]] > m/l,
 Integrate[Sqrt[((l^2) - (m^2)/((Sin[θ])^2))], {θ, 0, π}] // FullSimplify]
```

Integrate::idiv : Integral of $\sqrt{l^2 - m^2 \,\mathrm{Csc}[\theta]^2}$ does not converge on {0, π}. ≫

$$\int_0^{\pi} \sqrt{l^2 - m^2 \,\mathrm{Csc}[\theta]^2}\, d\theta$$

```
Gamma[-1]
```

ComplexInfinity

```
Series[Sqrt[((1) - (a^2)/(((θ)^2))], {θ, 0, 5}] // FullSimplify
```

$$\frac{\sqrt{-a^2}}{\theta} + \frac{\theta}{2\sqrt{-a^2}} + \frac{(-a)^{3/2}\,\theta^3}{8\,a^{9/2}} + \frac{\left(-a^2\right)^{3/2}\,\theta^5}{16\,a^8} + O[\theta]^6$$

```
Integrate[(1) - (a^2)/(2 ((Sin[θ])^2)), {θ, 0, π}] // FullSimplify
```

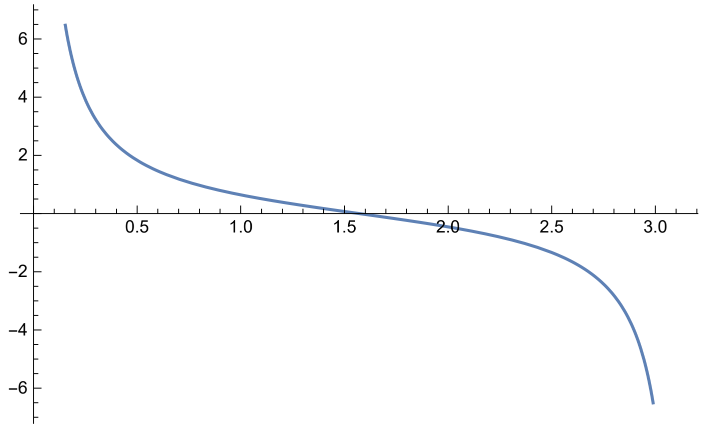
Integrate::idiv : Integral of $1 - \frac{1}{2} a^2 \,\mathrm{Csc}[\theta]^2$ does not converge on {0, π}. ≫

$$\int_0^{\pi} \left(1 - \frac{1}{2} a^2 \,\mathrm{Csc}[\theta]^2\right) d\theta$$

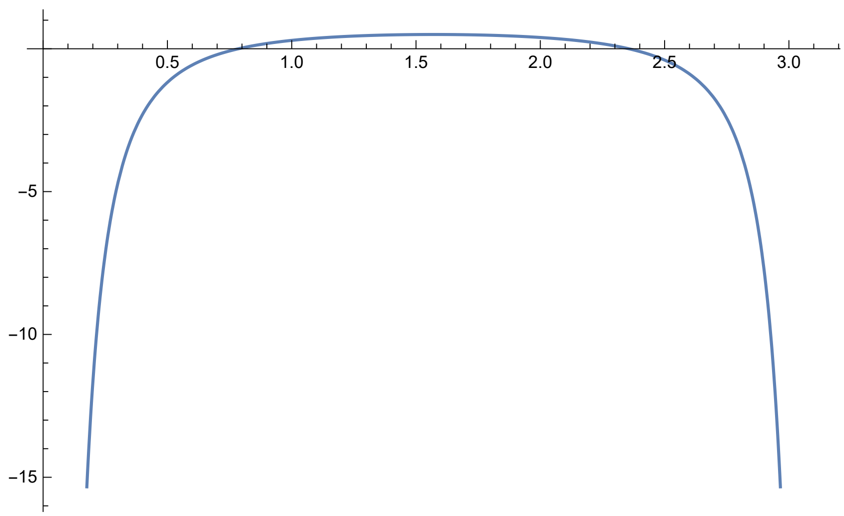
```
Integrate[1 - (1/2 a^2 Csc[θ]^2), θ] // FullSimplify
```

$$\theta + \frac{1}{2} a^2 \,\mathrm{Cot}[\theta]$$

```
Plot[Cot[x], {x, 0, π}]
```




```
Plot[1 - .5 Csc[x]^2, {x, 0, π}]
```



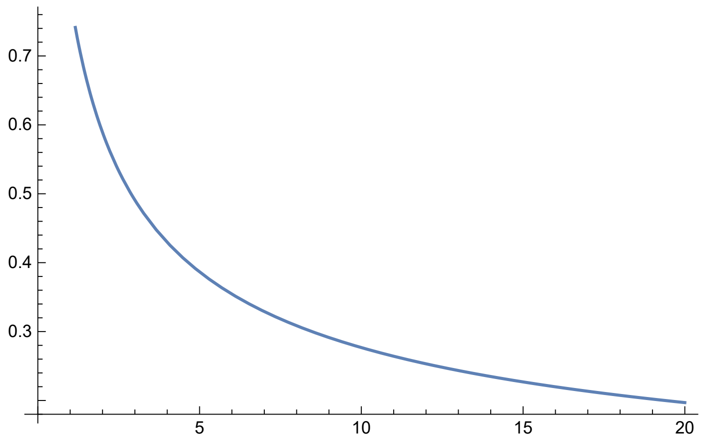

```
Csc[1]
```

```
Csc[1]
```

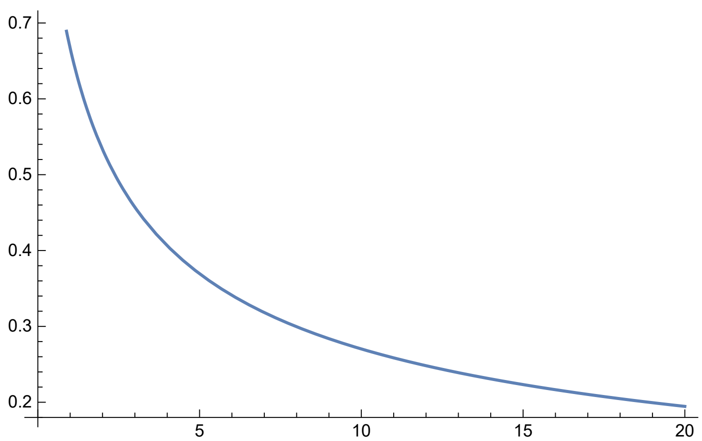
```
Integrate[Cos[θ]^4, {θ, 0, π}] // FullSimplify
```

$$\frac{3\pi}{8}$$

$$\text{Plot}\left[\frac{((2\,k)\,!)}{((2\hat{}\,(2\,k))\,((k\,!)\hat{}\,2))}\,\frac{\pi}{2},\ \{k,\,0,\,20\}\right]\ \text{(*n=2k, even Wallis Integral*)}$$



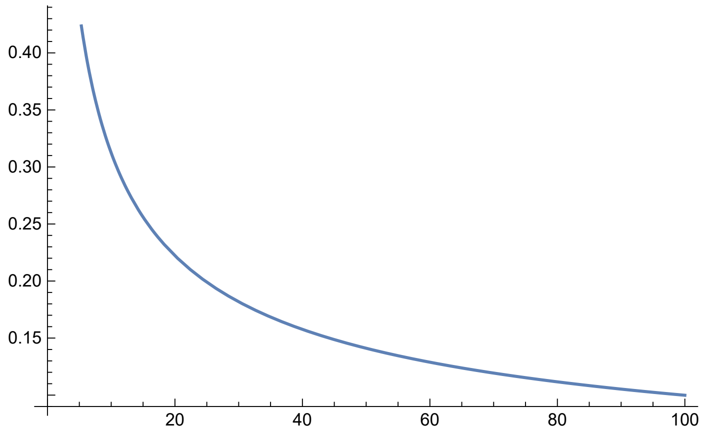
$$\text{Plot}\left[\frac{((2\hat{}\,(2\,k))\,((k\,!)\hat{}\,2))}{(((2\,k)+1)\,!)},\ \{k,\,0,\,20\}\right]\ \text{(*n=2k +1, odd Wallis Integral*)}$$



$$\frac{(2\,k+1)\,(((2\,k)\,!)^2)\,\frac{\pi}{2}+((2\hat{}\,(2\,k))\,((k\,!)\hat{}\,2))\hat{}\,2}{((2\hat{}\,(2\,k))\,((k\,!)\hat{}\,2))\,(((2\,k)+1)\,!)}\ \text{// FullSimplify}$$

$$\frac{\sqrt{\pi}\left(\text{Gamma}\left[\frac{1}{2}+k\right]+\frac{\text{Gamma}[1+k]^2}{\text{Gamma}\left[\frac{3}{2}+k\right]}\right)}{2\,\text{Gamma}[1+k]}$$

```
Plot[{Gamma[1/2 + k]/Gamma[1 + k]}, {k, 0, 100}]
```



$$\text{Limit}\left[\frac{\sqrt{\pi}\left(\text{Gamma}\left[\frac{1}{2}+k\right]+\frac{\text{Gamma}[1+k]^2}{\text{Gamma}\left[\frac{3}{2}+k\right]}\right)}{2\,\text{Gamma}[1+k]}, k \to \infty\right]$$

0

$$\text{Limit}\left[\frac{1}{((2k+1))}\frac{\pi}{2}, k \to \infty\right]$$

0