

# Airy T – bar integral

```
bigairydelta[p_] := (Pi / 4) + (2 p^3 / 3)
smallairydelta[p_] := 3^(2 / 3) (Gamma[4 / 3] / Gamma[2 / 3]) p
bigairypade[p_] := (c p + b p^3 + (b c / a) p^4) / (1 + (c / a) p)
smallairypade[p_] := c p + b p^3

a = Pi / 4

$$\frac{\pi}{4}$$

b = 2 / 3

$$\frac{2}{3}$$

c = 3^(2 / 3) Gamma[4 / 3] / Gamma[2 / 3]

$$\frac{3^{2/3} \Gamma\left[\frac{4}{3}\right]}{\Gamma\left[\frac{2}{3}\right]}$$

airypade[p_] := h[p] bigairypade[p] + (1 - h[p]) smallairypade[p]
h[p_] := (Tanh[s (p - 0.8)] + 1) / 2
s = 1.5
1.5

ruint[u_, r_, z_] := Pi^(-3) r  $\sqrt{1 - u^2}$  Cos[2 z r u - 2 airypade[r u]]
rintlo[r_, z_] := NIntegrate[ruint[u, r, z], {u, 0, 1}]
rintlo[1, -1]
-0.0026522
rintlo[0, -1]
NIntegrate::ncvb :
NIntegrate failed to converge to prescribed accuracy after 9 recursive
bisections in u near {u} = {0.666031}. NIntegrate obtained
0.` and 0.` for the integral and error estimates. >>
0.
rintlo[0.01, -1]
0.000253232
rintlo[5, -1]
-0.000637965
```

```
rintlo[10, -1]
```

```
NIntegrate::slwcon:
```

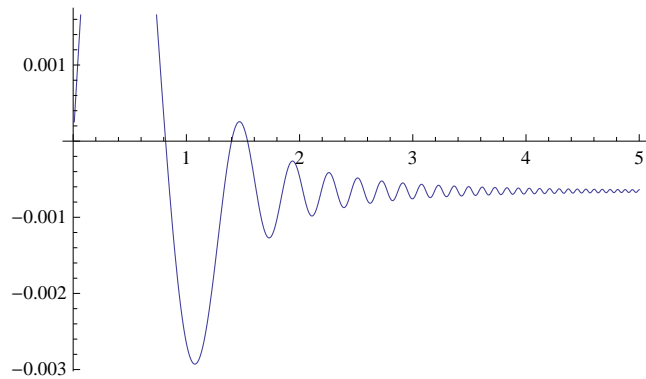
```
Numerical integration converging too slowly; suspect one of the following:  
singularity, value of the integration is 0, highly  
oscillatory integrand, or WorkingPrecision too small. >>
```

```
NIntegrate::ncvb:
```

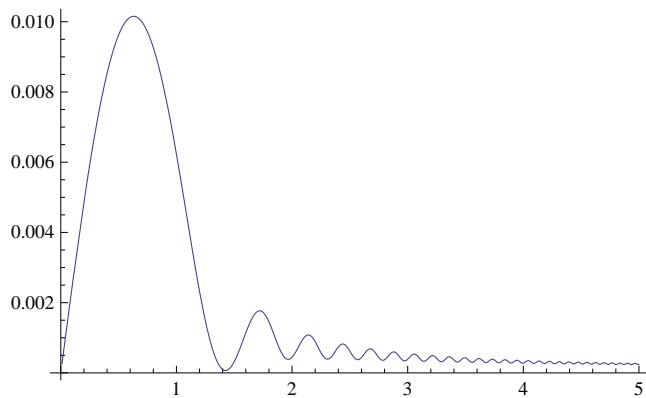
```
NIntegrate failed to converge to prescribed accuracy after 9 recursive bisections  
in u near {u} = {0.935562}. NIntegrate obtained -0.000654482  
and 5.1217400536557`*^-7 for the integral and error estimates. >>
```

```
-0.000654482
```

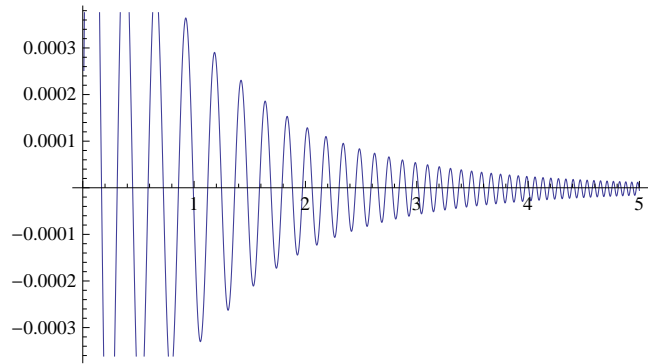
```
Plot[rintlo[r, -1], {r, 0.01, 5}]
```



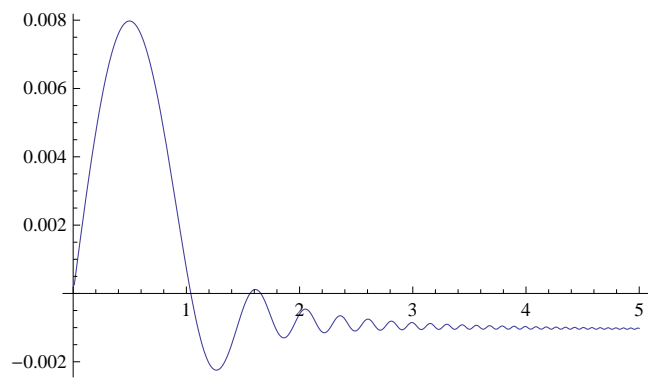
```
Plot[rintlo[r, -0.1], {r, 0.01, 5}]
```



```
Plot[rintlo[r, -10], {r, 0.01, 5}]
```



```
Plot[rintlo[r, -0.5], {r, 0.01, 5}]
```



```
Plot[rintlo[r, -2], {r, 0.01, 5}]
```

