

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]
```

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

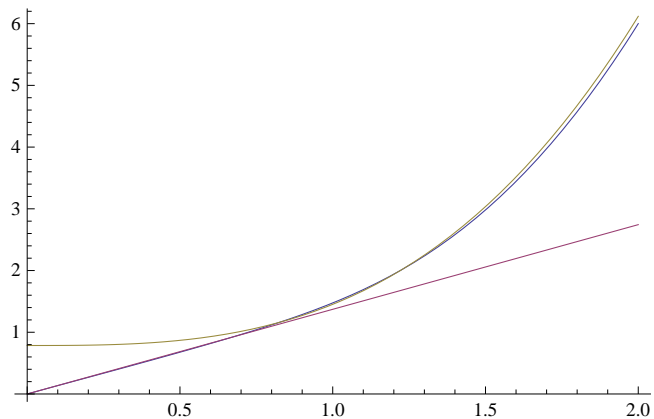
```
airypade[p_] := h[p] bigairypade[p] + (1 - h[p]) smallairypade[p]
```

```
h[p_] := (Tanh[s (p - 0.8)] + 1) / 2
```

```
s = 1.5
```

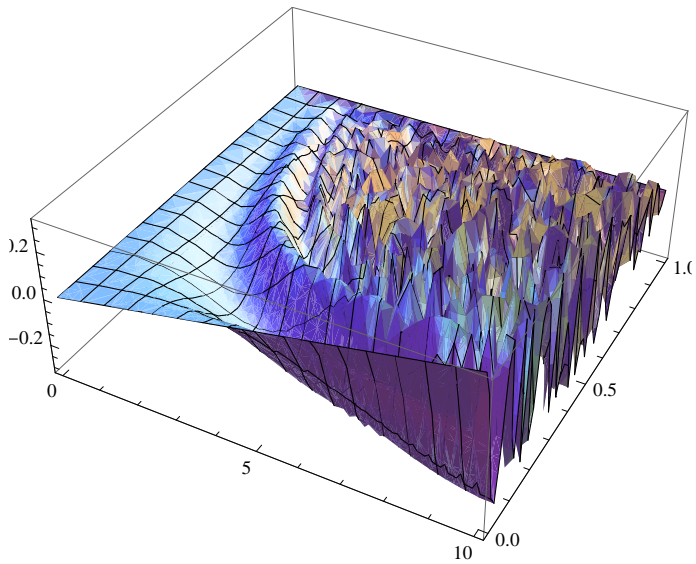
```
1.5
```

```
Plot[{airypade[p], smallairydelta[p], bigairydelta[p]}, {p, 0, 2}]
```

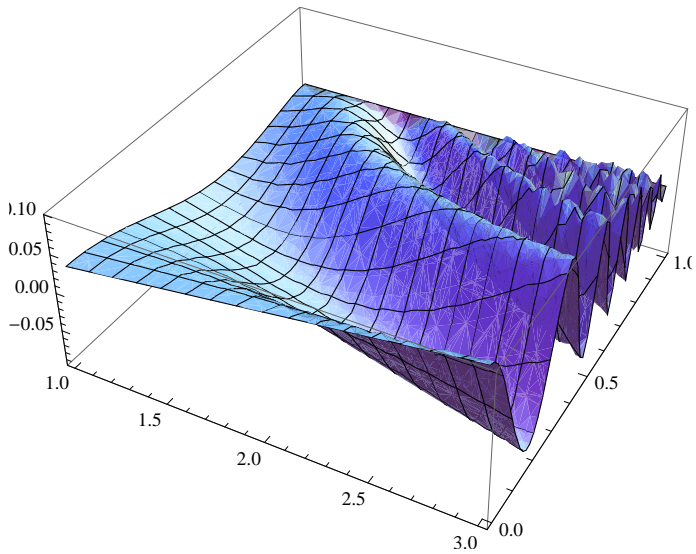


```
ruint[u_, r_, z_] := Pi^(-3) r sqrt[1 - u^2] Cos[2 z r u - 2 airypade[r u]]
```

```
Plot3D[ruint[u, r, -1], {r, 0, 10}, {u, 0, 1}]
```



```
Plot3D[ruint[u, r, -1], {r, 1, 3}, {u, 0, 1}]
```



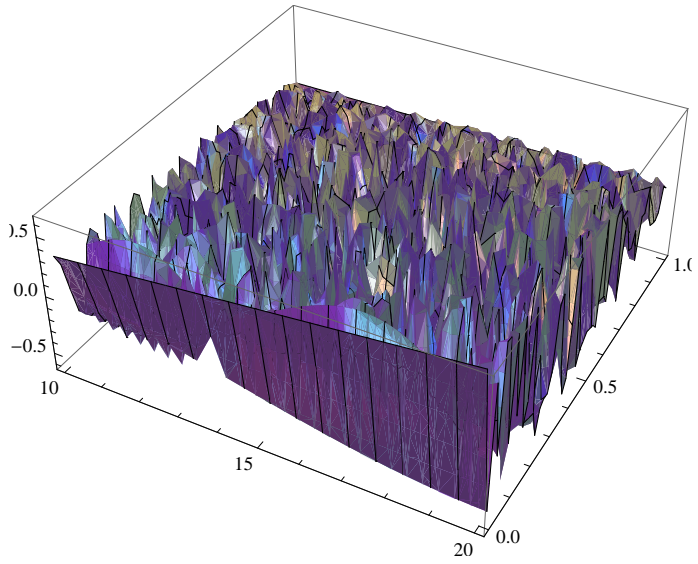
```
NIntegrate[ruint[u, r, -1], {r, 0, 3}, {u, 0, 1}]
```

NIntegrate::slwcon :

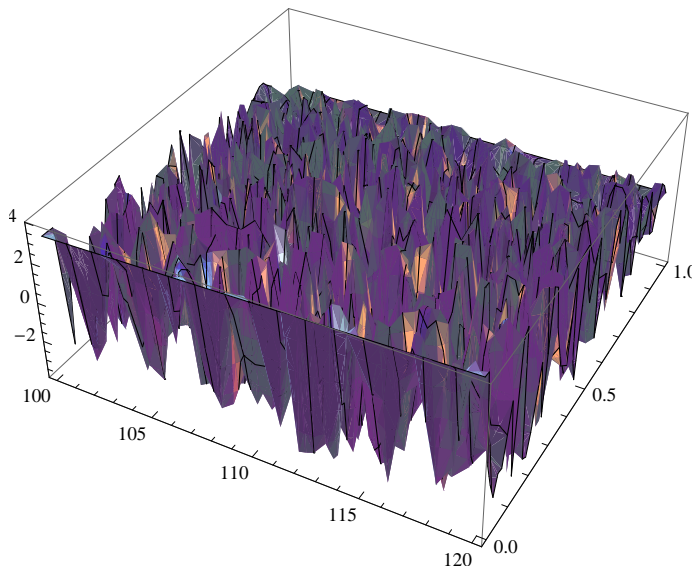
Numerical integration converging too slowly; suspect one of the following:
singularity, value of the integration is 0, highly
oscillatory integrand, or WorkingPrecision too small. >>

0.00120267

```
Plot3D[ruint[u, r, -1], {r, 10, 20}, {u, 0, 1}]
```



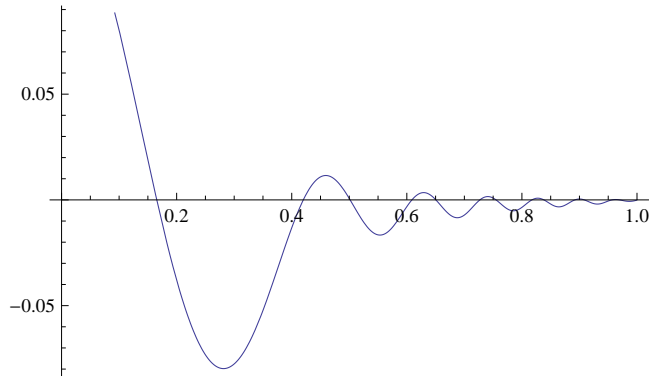
```
Plot3D[ruint[u, r, -1], {r, 100, 120}, {u, 0, 1}]
```



```
NIntegrate[ruint[0.5, r, -1], {r, 0, 3}]
```

0.000674286

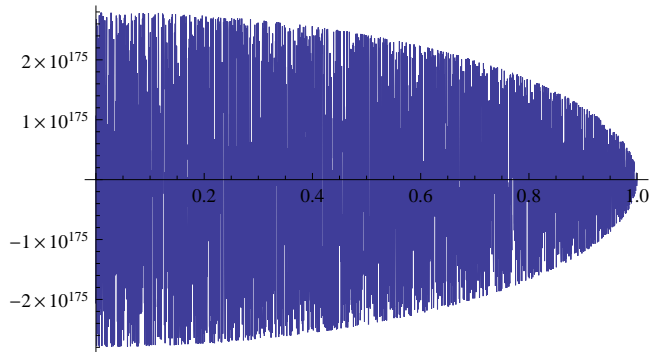
```
Plot[NIntegrate[ruint[u, r, -1], {r, 0, 3}], {u, 0, 1}]
```



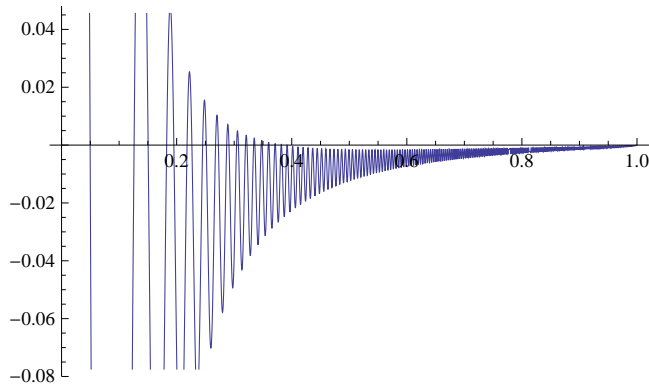
```
Plot[NIntegrate[ruint[u, r, -1], {r, 0, Infinity}], {u, 0, 1}]
```

NIntegrate::ncvb :

NIntegrate failed to converge to prescribed accuracy after 9 recursive bisections in r near {r} = {6.3887 × 10⁵⁶}. NIntegrate obtained 4.96940661966494`*¹⁷⁴ and 4.96940661966494`*¹⁷⁴ for the integral and error estimates. >



```
Plot[NIntegrate[ruint[u, r, -1], {r, 0, 10}], {u, 0, 1}]
```



```
rieszlrz[z_, lambda_] := NIntegrate[(1 - (r / lambda)) ruint[u, r, z], {r, 0, lambda}, {u, 0, 1}]
```

```
riesz1ru[-1, 3]
```

```
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. >>
```

```
0.00189047
```

```
riesz2ru[z_, lambda_] :=
```

```
NIntegrate[(1 - (r / lambda)^2) ruint[u, r, z], {r, 0, lambda}, {u, 0, 1}]
```

```
riesz2ru[-1, 3]
```

```
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. >>
```

```
0.00185129
```

```
riesz1ur[z_, lambda_] := NIntegrate[(1 - (r / lambda)) ruint[u, r, z], {u, 0, 1}, {r, 0, lambda}]
```

```
riesz1ur[-1, 3]
```

```
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. >>
```

```
0.00189047
```

```
riesz2ur[z_, lambda_] :=
```

```
NIntegrate[(1 - (r / lambda)^2) ruint[u, r, z], {u, 0, 1}, {r, 0, lambda}]
```

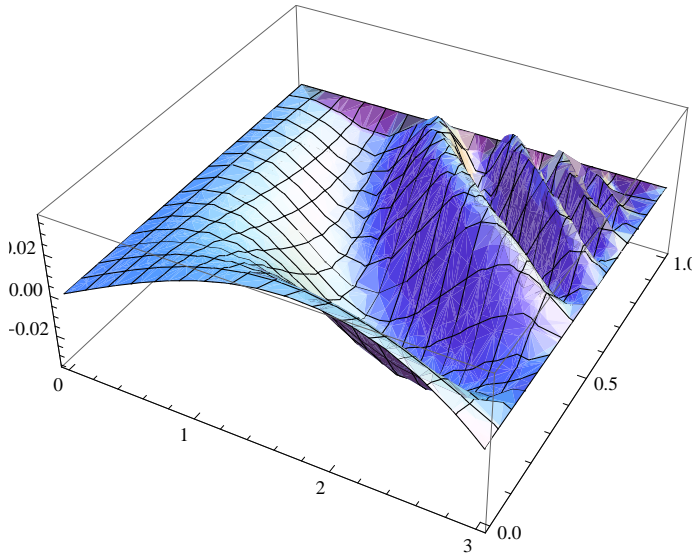
```
riesz2ur[-1, 3]
```

```
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. >>
```

```
0.00185129
```

```
Plot3D[(1 - (r / 3) ^ 2) ruint[u, r, -1], {r, 0, 3}, {u, 0, 1}]
```



```
riesz2ur[-0.1, 3]
```

```
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. >>
```

```
0.00847096
```

```
riesz2ur[-3, 3]
```

```
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. >>
```

```
0.000667577
```

```
riesz2ur[-0.5, 3]
```

```
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. >>
```

```
0.00399805
```

```
riesz2ur[0, 3]
```

```
NIntegrate::slwcon :
```

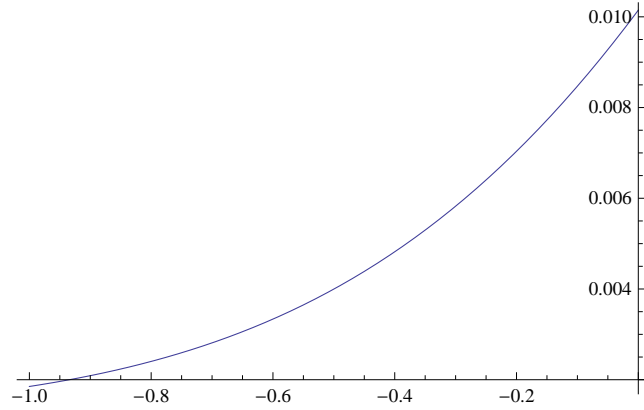
```
Numerical integration converging too slowly; suspect one of the following:
singularity, value of the integration is 0, highly
oscillatory integrand, or WorkingPrecision too small. >>
```

```
0.0101475
```

```
Plot[riesz2ur[z, 3], {z, -1, 0}]
```

```
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. >>
```



```
Plot[0.01015 (z - 1) ^ (-2), {z, -1, 0}]
```

