

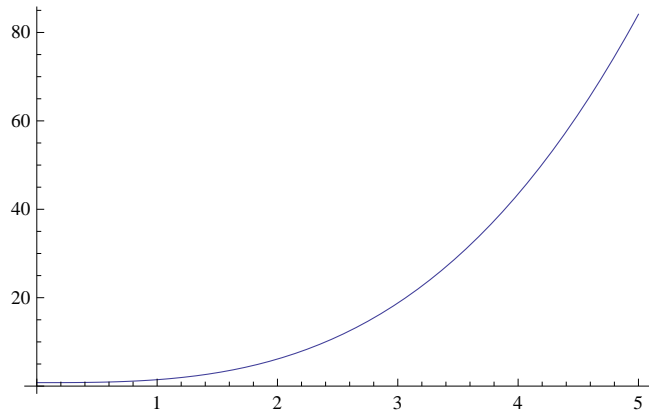
Airy phase functions

```
bigairydelta[p_] := (Pi / 4) + (2 p^3 / 3)
```

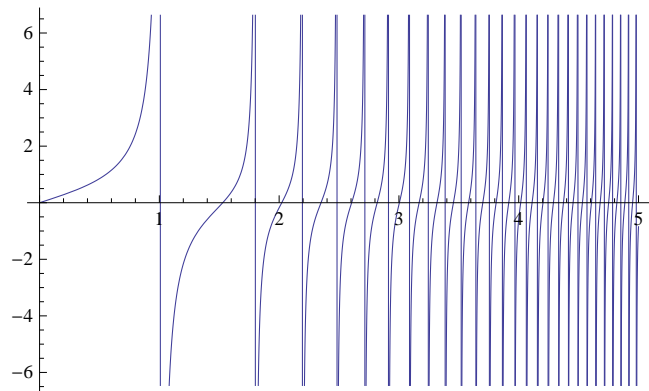
```
(* z_0 = 1, lambda = 1. *)
```

```
tanairydelta[p_] := -p (AiryAi[0 - p^2] / AiryAiPrime[0 - p^2])
```

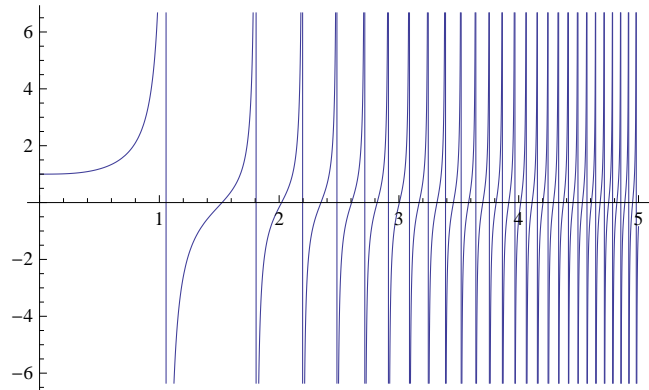
```
Plot[bigairydelta[p], {p, 0, 5}]
```



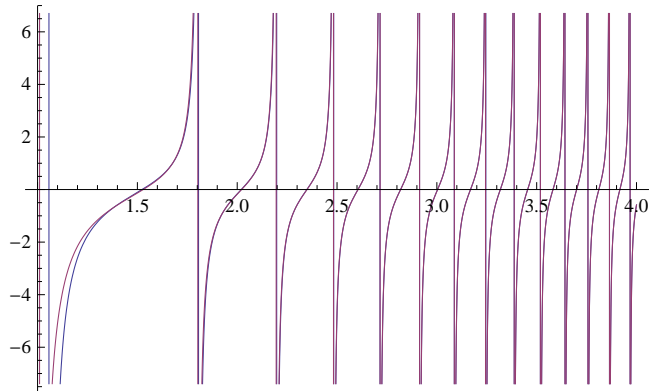
```
Plot[tanairydelta[p], {p, 0, 5}]
```



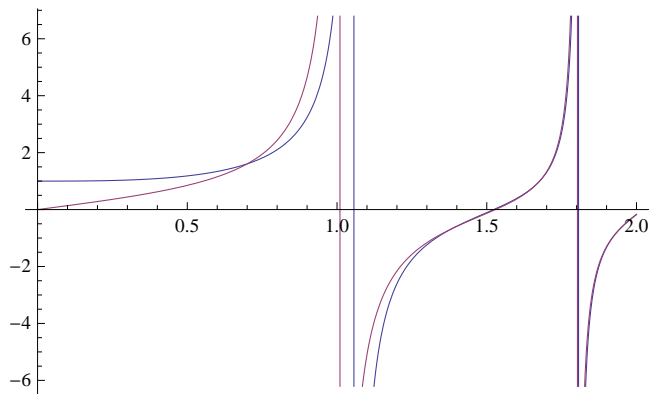
```
Plot[Tan[bigairydelta[p]], {p, 0, 5}]
```



```
Plot[{Tan[bigairydelta[p]], tanairydelta[p]}, {p, 1, 4}]
```

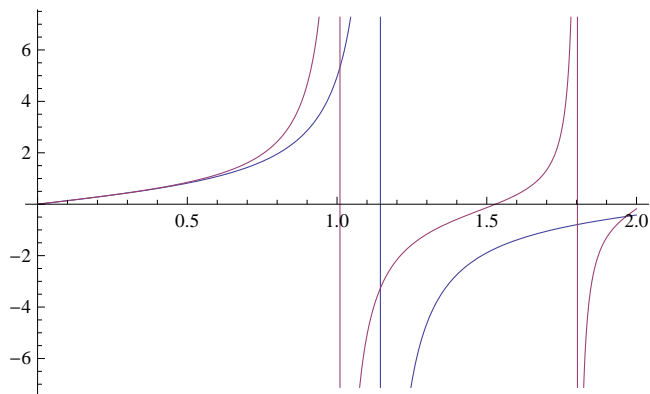


```
Plot[{Tan[bigairydelta[p]], tanairydelta[p]}, {p, 0, 2}]
```

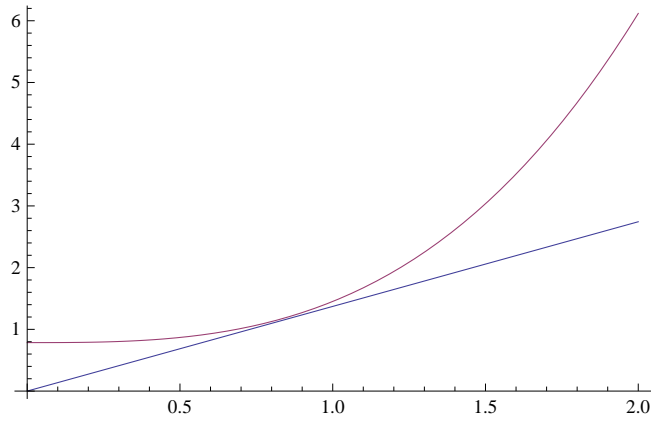


```
smallairydelta[p_] := 3^(2/3) (Gamma[4/3] / Gamma[2/3]) p
```

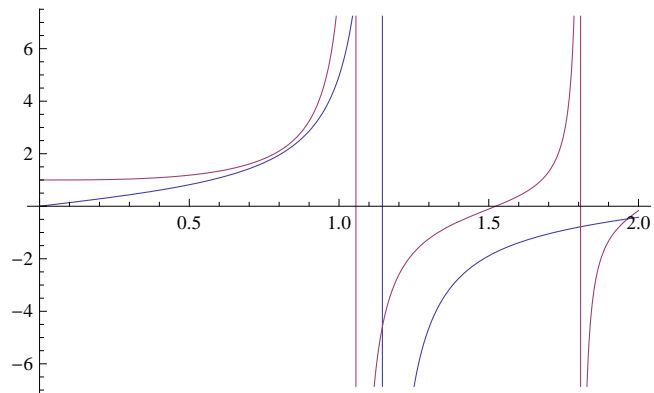
```
Plot[{Tan[smallairydelta[p]], tanairydelta[p]}, {p, 0, 2}]
```



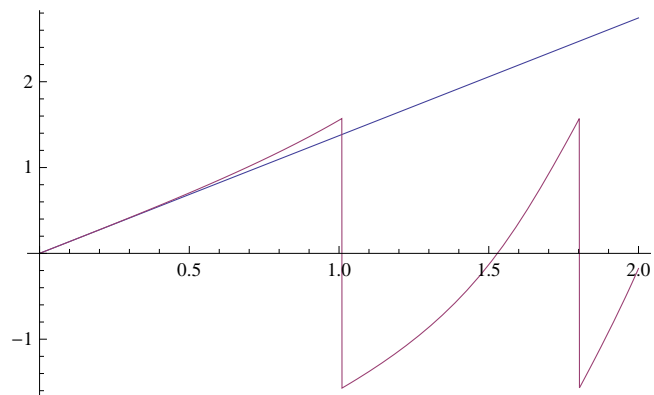
```
Plot[{smallairydelta[p], bigairydelta[p]}, {p, 0, 2}]
```



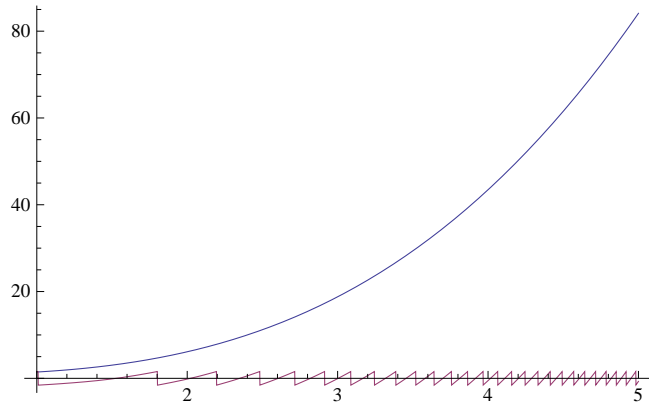
```
Plot[{Tan[smallairydelta[p]], Tan[bigairydelta[p]]}, {p, 0, 2}]
```



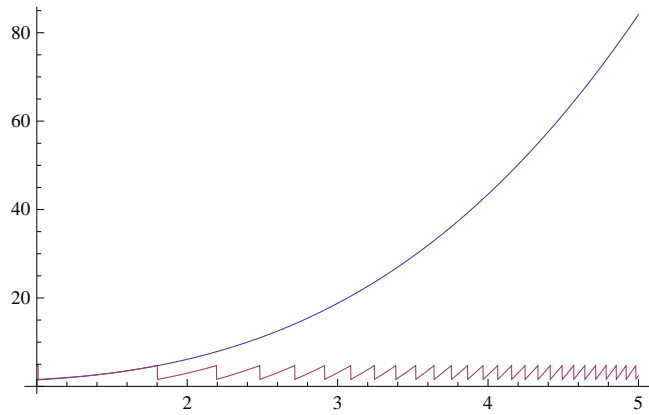
```
Plot[{smallairydelta[p], ArcTan[tanairydelta[p]]}, {p, 0, 2}]
```



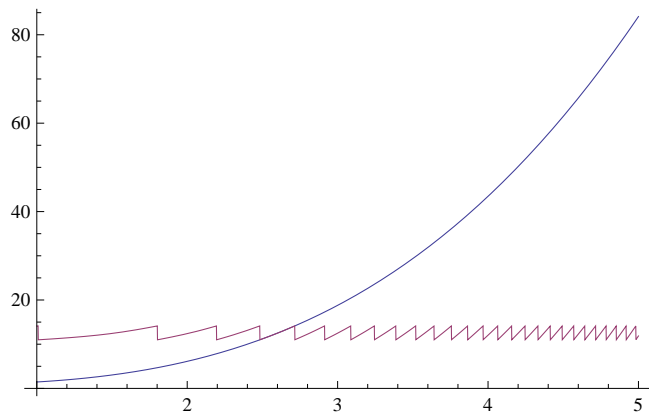
```
Plot[{bigairydelta[p], ArcTan[tanairydelta[p]]}, {p, 1, 5}]
```



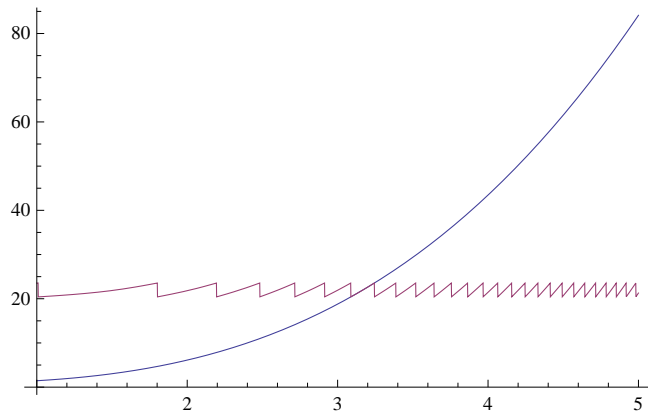
```
Plot[{bigairydelta[p], ArcTan[tanairydelta[p]] + Pi}, {p, 1, 5}]
```



```
Plot[{bigairydelta[p], ArcTan[tanairydelta[p]] + 4 Pi}, {p, 1, 5}]
```



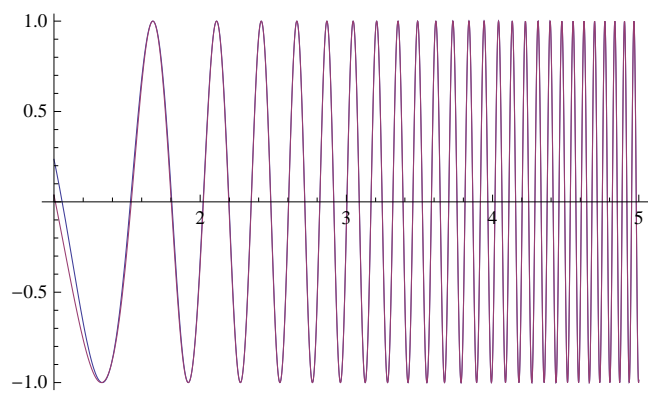
```
Plot[{bigairydelta[p], ArcTan[tanairydelta[p]] + 7 Pi}, {p, 1, 5}]
```



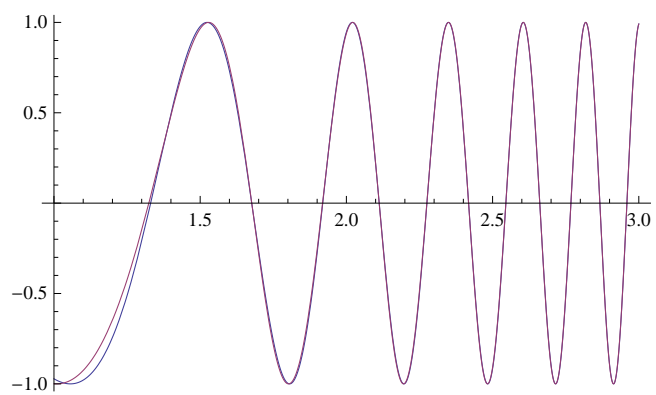
```
sintwodelta[t_] := 2 t / (1 + t^2)
```

```
costwodelta[t_] := (1 - t^2) / (1 + t^2)
```

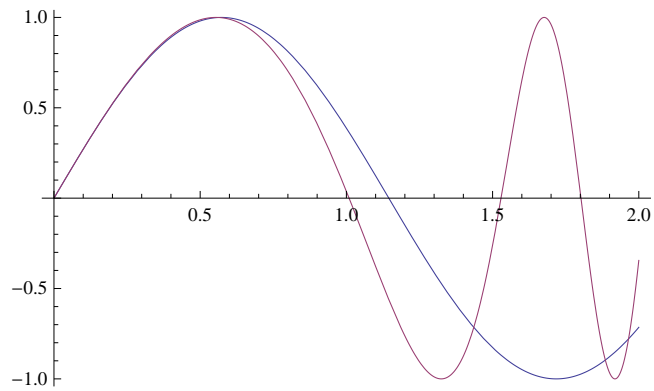
```
Plot[{Sin[2 bigairydelta[p]], sintwodelta[tanairydelta[p]]}, {p, 1, 5}]
```



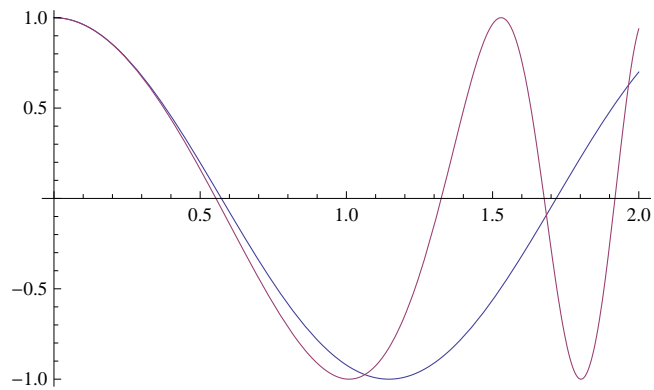
```
Plot[{Cos[2 bigairydelta[p]], costwodelta[tanairydelta[p]]}, {p, 1, 3}]
```



```
Plot[{Sin[2 smallairydelta[p]], sintwodelta[tanairydelta[p]]}, {p, 0, 2}]
```



```
Plot[{Cos[2 smallairydelta[p]], costwodelta[tanairydelta[p]]}, {p, 0, 2}]
```



```
smallairyfade[p_] := c p + b p^3
```

```
bigairyfade[p_] := (c p + b p^3 + (b c / a) p^4) / (1 + (c / a) p)
```

```
a = Pi / 4
```

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

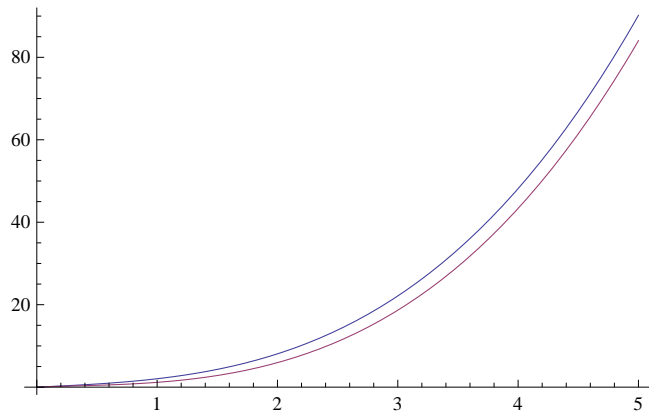
```
b = 2 / 3
```

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

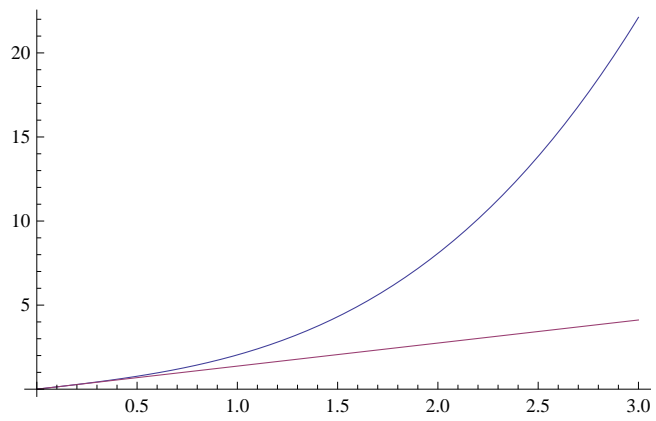
```
c = 3^(2 / 3) Gamma[4 / 3] / Gamma[2 / 3]
```

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

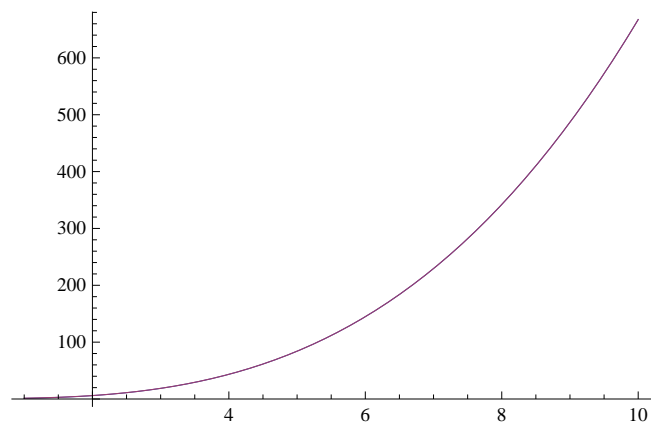
```
Plot[{smallairyfade[p], bigairyfade[p]}, {p, 0, 5}]
```



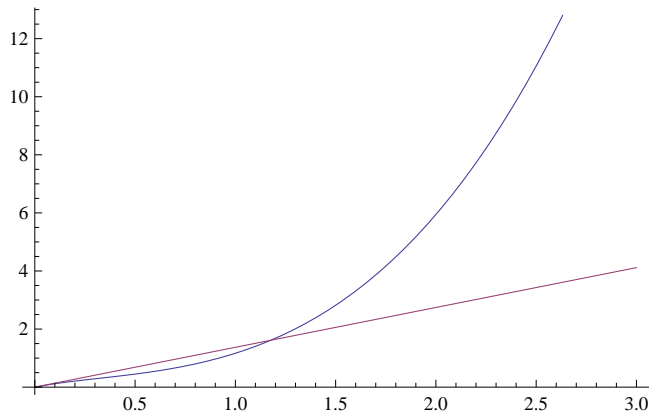
```
Plot[{smallairyfade[p], smallairydelta[p]}, {p, 0, 3}]
```



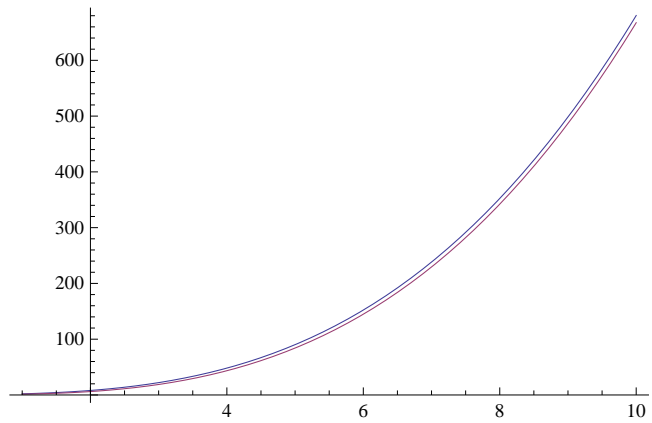
```
Plot[{bigairyfade[p], bigairydelta[p]}, {p, 1, 10}]
```



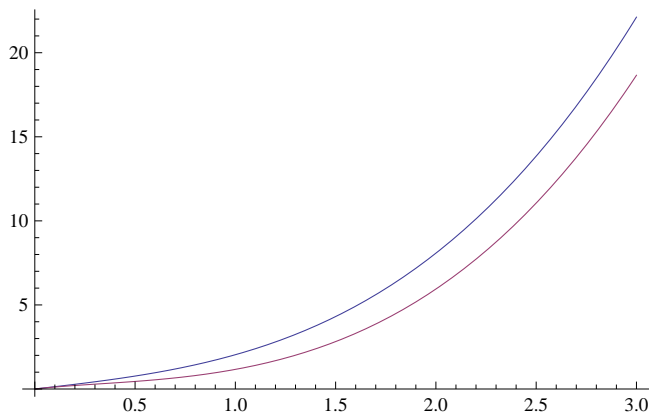
```
Plot[{bigairyfade[p], smallairydelta[p]}, {p, 0, 3}]
```



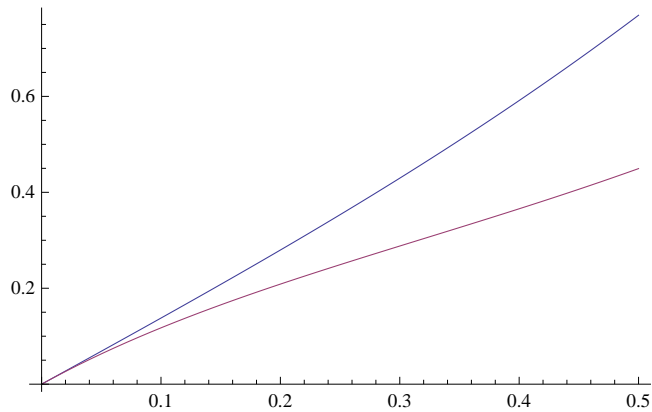
```
Plot[{smallairyfade[p], bigairydelta[p]}, {p, 1, 10}]
```



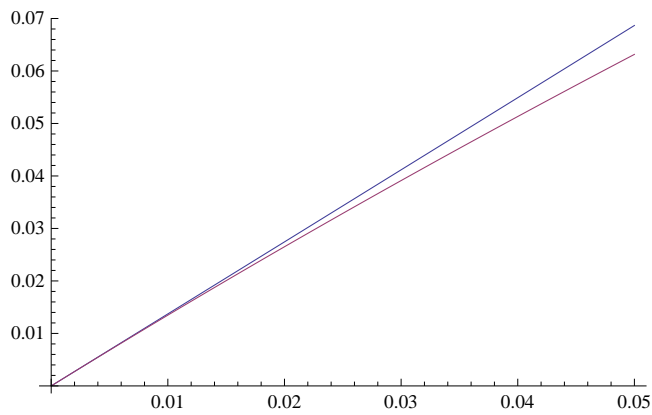
```
Plot[{smallairyfade[p], bigairyfade[p]}, {p, 0, 3}]
```



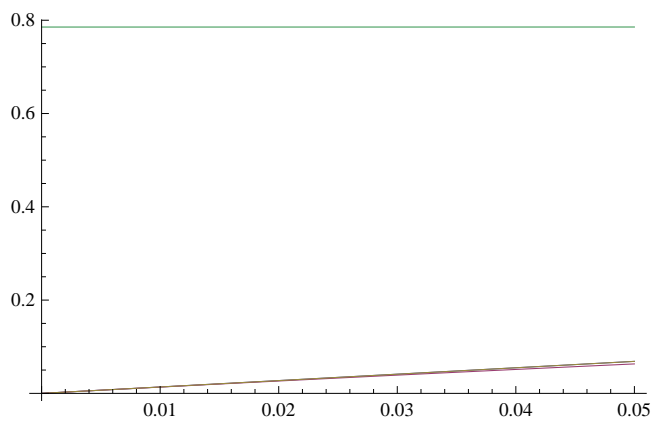

```
Plot[{smallairyfade[p], bigairyfade[p]}, {p, 0, 0.5}]
```



```
Plot[{smallairyfade[p], bigairyfade[p]}, {p, 0, 0.05}]
```



```
Plot[{smallairyfade[p], bigairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0, 0.05}]
```



```
N[{smallairyfade[0], bigairyfade[0], smallairydelta[0], bigairydelta[0]}]
```

```
{0., 0., 0., 0.785398}
```

```
N[{smallairyfade[0.1], bigairyfade[0.1], smallairydelta[0.1], bigairydelta[0.1]}]
```

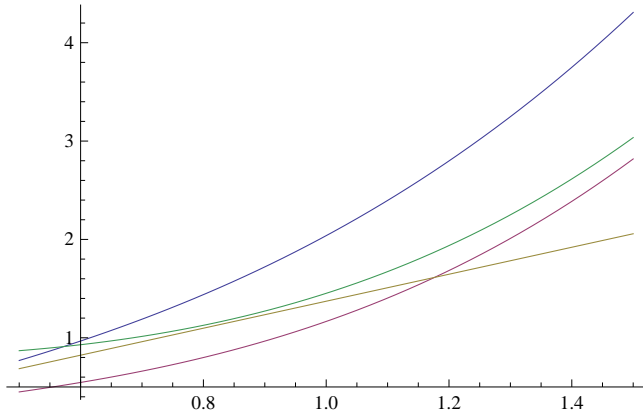
```
{0.137839, 0.117443, 0.137172, 0.786065}
```

```
N[{smallairyfade[0.5], bigairyfade[0.5], smallairydelta[0.5], bigairydelta[0.5]}]
{0.769194, 0.449464, 0.685861, 0.868731}
```

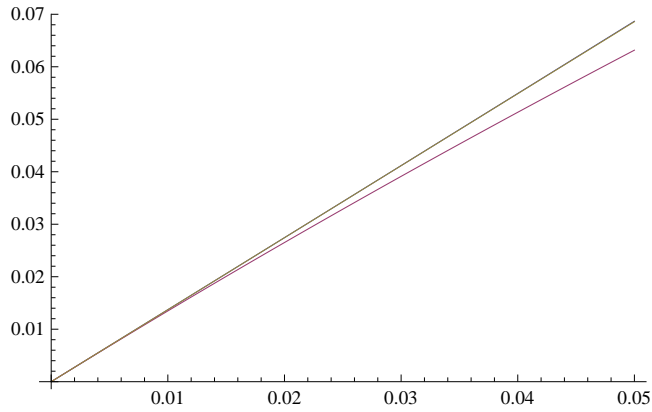
```
N[{smallairyfade[1], bigairyfade[1], smallairydelta[1], bigairydelta[1]}]
{2.03839, 1.1661, 1.37172, 1.45206}
```

```
N[{smallairyfade[1.5], bigairyfade[1.5], smallairydelta[1.5], bigairydelta[1.5]}]
{4.30758, 2.81843, 2.05758, 3.0354}
```

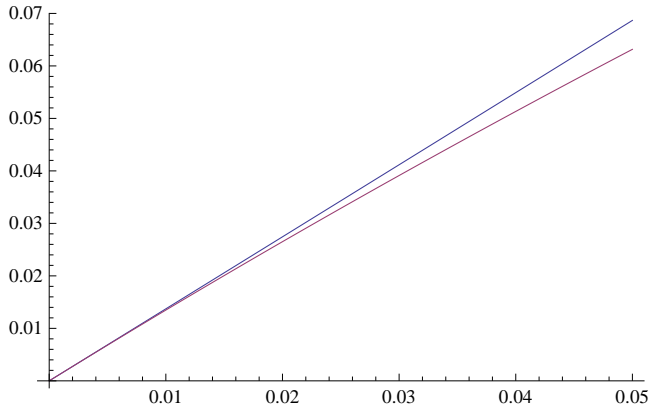
```
Plot[{smallairyfade[p], bigairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.5, 1.5}]
```



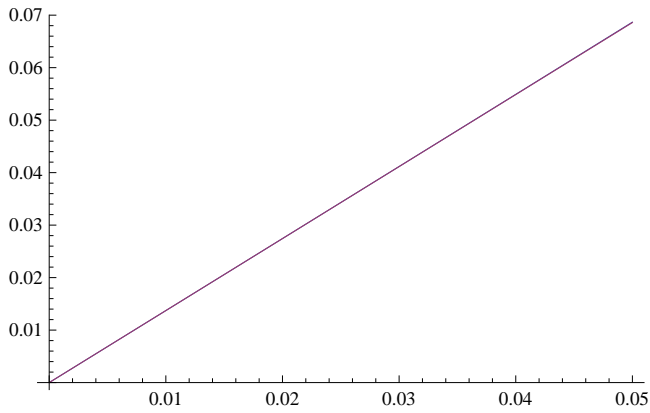
```
Plot[{smallairyfade[p], bigairyfade[p], smallairydelta[p]}, {p, 0, 0.05}]
```



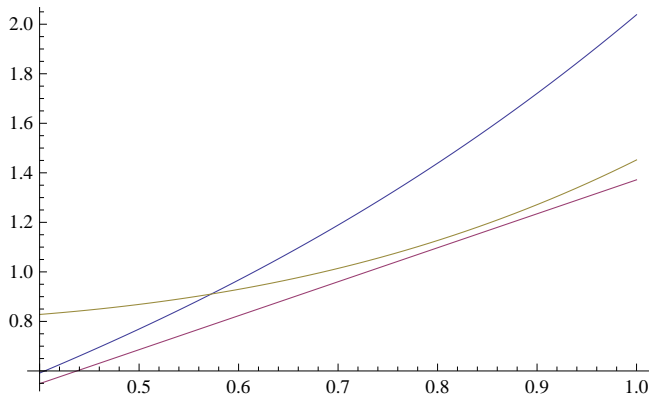
Plot[{smallairyfade[p], bigairyfade[p]}, {p, 0, 0.05}]



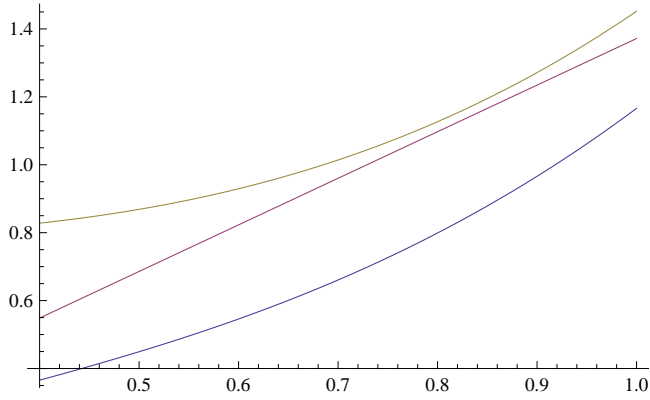
Plot[{smallairyfade[p], smallairydelta[p]}, {p, 0, 0.05}]



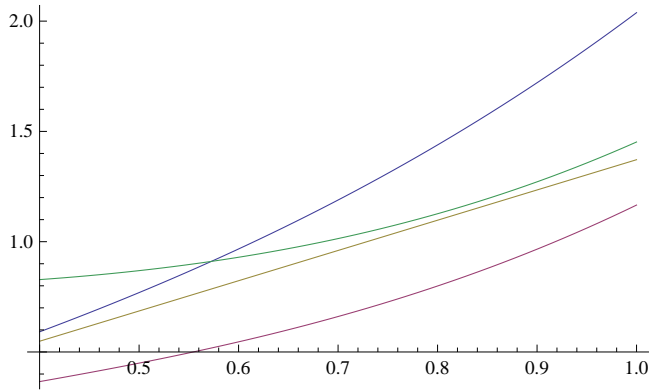
Plot[{smallairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.4, 1.0}]



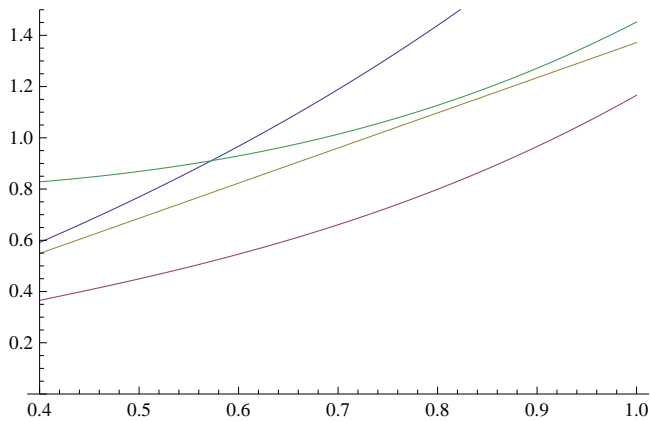
`Plot[{bigairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.4, 1.0}]`



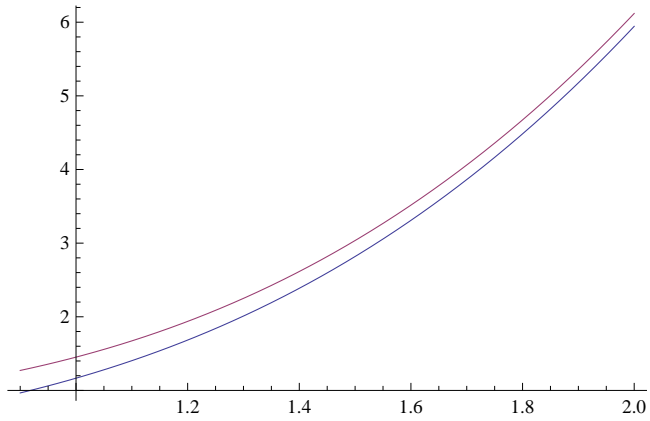
`Plot[{smallairyfade[p], bigairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.4, 1.0}]`



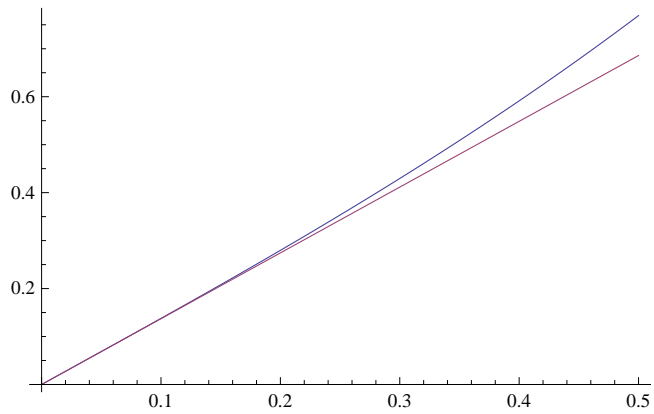
`Plot[{smallairyfade[p], bigairyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.4, 1.0}, PlotRange -> {0, 1.5}]`



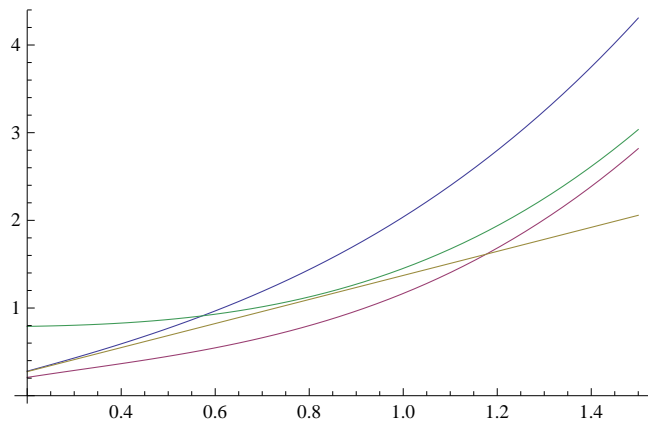
```
Plot[{bigairypade[p], bigairydelta[p]}, {p, 0.9, 2.0}]
```



```
Plot[{smallairypade[p], smallairydelta[p]}, {p, 0, 0.5}]
```



```
Plot[{smallairypade[p], bigairypade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.2, 1.5}]
```



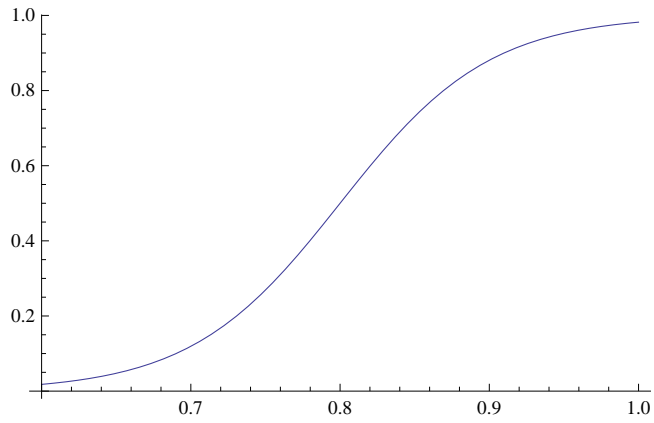
```
airyphase[p_] := h[p] bigairypade[p] + (1 - h[p]) smallairypade[p]
```

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

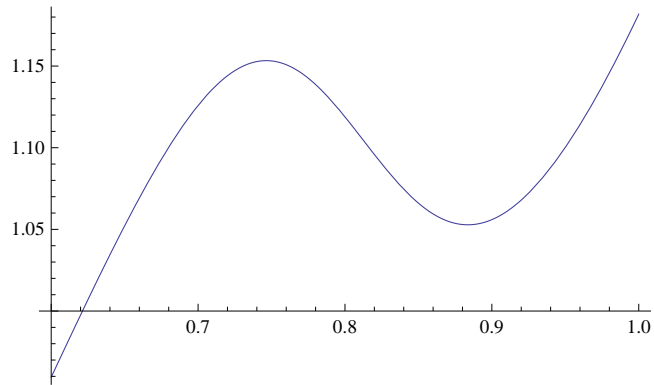
```
s = 10
```

```
10
```

```
Plot[h[p], {p, 0.6, 1}]
```



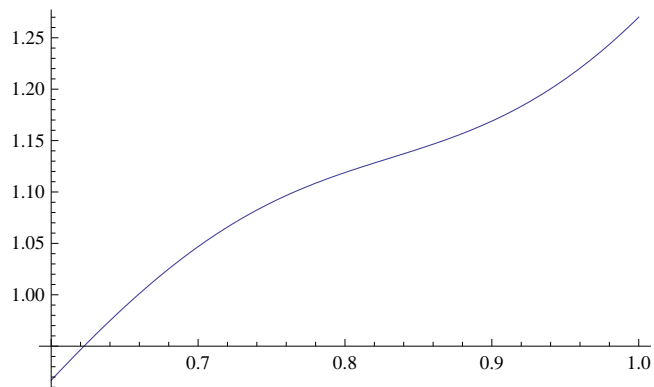
```
Plot[airyphase[p], {p, 0.6, 1}]
```



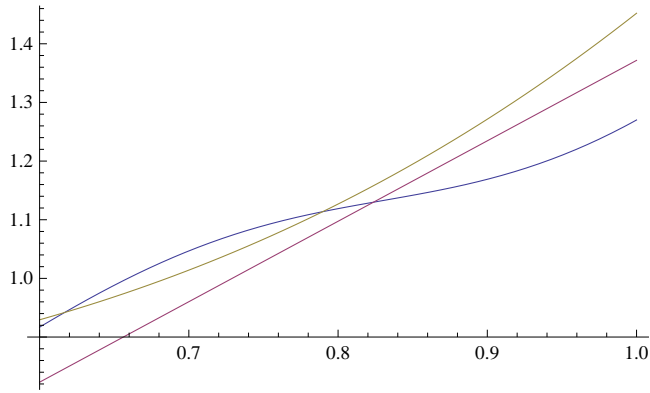
s = 5

5

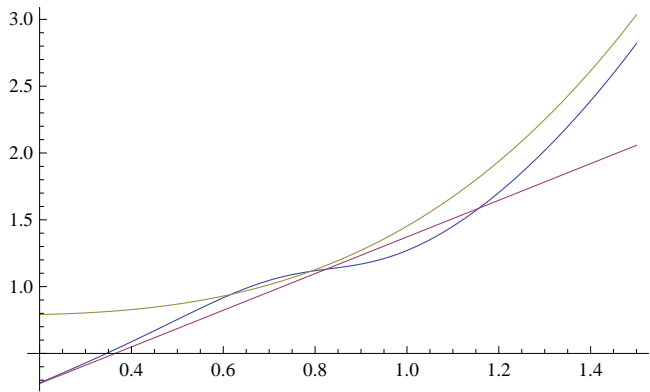
```
Plot[airyphase[p], {p, 0.6, 1}]
```



Plot[{airyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.6, 1}]



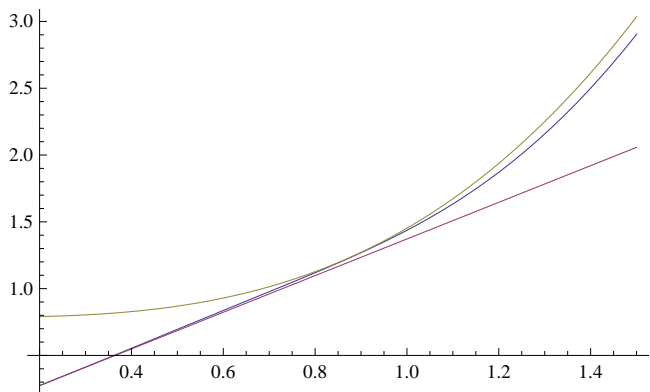
Plot[{airyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.2, 1.5}]



s = 2

2

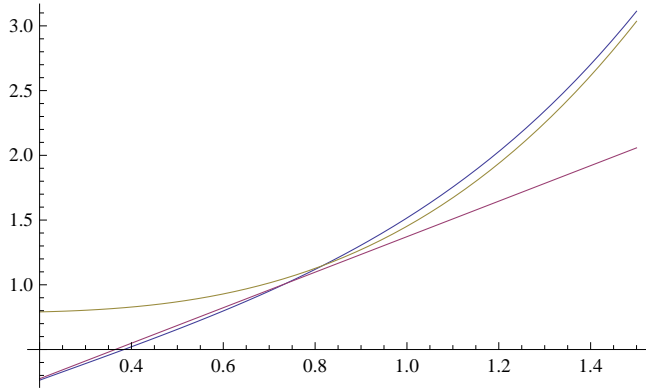
Plot[{airyfade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.2, 1.5}]



s = 1

1

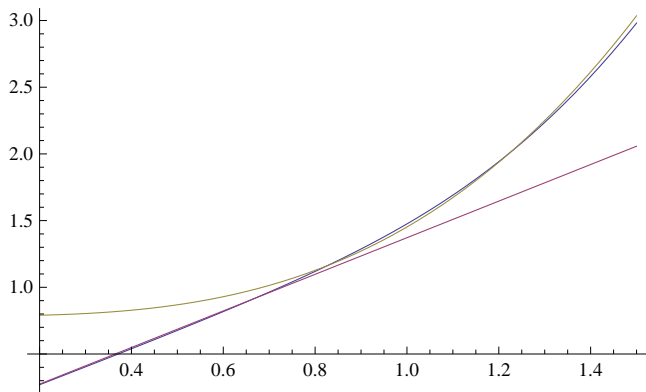
`Plot[{airygade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.2, 1.5}]`



s = 1.5

1.5

`Plot[{airygade[p], smallairydelta[p], bigairydelta[p]}, {p, 0.2, 1.5}]`



`Plot[{airygade[p], smallairydelta[p], bigairydelta[p], smallairygade[p], bigairygade[p]}, {p, 0.2, 1.5}, PlotRange -> {0, 3.2}]`

