In[1]:=
```
f[d_] = Piecewise[{{1 / (s * (d) ^ (1 / 2)) - 1 / (s^2), 0 < d < s^2}, {0, d > s^2}}]
```

Out[1]=
$$\begin{cases} -\frac{1}{s^2}+\frac{1}{\sqrt{d}\ s} & 0<d<s^2 \\ 0 & \text{True} \end{cases}$$

In[2]:=
```
g[x_] := Convolve[f[d], f[d], d, x, Assumptions → {d ∈ Reals, x ∈ Reals}]
Simplify[g[x], {s > 0, x ∈ Reals}]
```

Out[3]=
$$\begin{cases} \frac{\pi\, s^2-4\, s\, \sqrt{x}+x}{s^4} & x>0 \&\& s^2 \geq x \\ -\frac{2\, s^2+x+\frac{4\, s^3}{\sqrt{-s^2+x}}-\frac{4\, s\, x}{\sqrt{-s^2+x}}-2\, s^2\, \text{ArcTan}\left[\frac{s}{\sqrt{-s^2+x}}\right]+i\, s^2\, \text{Log}\left[s-i\, \sqrt{-s^2+x}\ \right]-i\, s^2\, \text{Log}\left[s+i\, \sqrt{-s^2+x}\ \right]}{s^4} & s^2<x \&\& 2\, s^2>x \\ 0 & \text{True} \end{cases}$$

In[4]:=
```
h[x_] := g[x^2] * 2 * x
```

In[5]:=
```
Simplify[h[x], {s > 0, x ∈ Reals, x > 0}]
```

Out[5]=
$$2\, x \left(\begin{cases} \frac{\pi\, s^2-4\, s\, x+x^2}{s^4} & s \geq x \\ -\frac{2\, s^2+x^2+\frac{4\, s^3}{\sqrt{-s^2+x^2}}-\frac{4\, s\, x^2}{\sqrt{-s^2+x^2}}-2\, s^2\, \text{ArcTan}\left[\frac{s}{\sqrt{-s^2+x^2}}\right]+2\, s^2\, \text{ArcTan}\left[\frac{\sqrt{-s^2+x^2}}{s}\right]}{s^4} & s<x \&\& \sqrt{2}\ s>x \\ 0 & \text{True} \end{cases} \right)$$

In[6]:=
```
(*For s == 1, h becomes*)
```

In[7]:=
```
Simplify[h[x], {s == 1, x ∈ Reals, x > 0}]
```

Out[7]=
$$2\, x \left(\begin{cases} \pi+(-4+x)\, x & x \leq 1 \\ -2-x^2+4\, \sqrt{-1+x^2}\ -2\, \text{ArcCot}\left[\frac{1}{\sqrt{-1+x^2}}\right]+2\, \text{ArcTan}\left[\frac{1}{\sqrt{-1+x^2}}\right] & 1<x<\sqrt{2} \\ 0 & \text{True} \end{cases} \right)$$

In[8]:=
```
(*Expected Value*)
s := 1.
Integrate[x * h[x], {x, 0, Sqrt[2]}]
```

Out[9]=
```
0.521405
```