$In[\bullet]:=$ `Pa[i_, ti_, tz_, N_] := (1 - 4 * tz / N) ^2 / N^2 * Sum[(3 - 4 * t / N) ^2, {t, tz, N - 1}]`
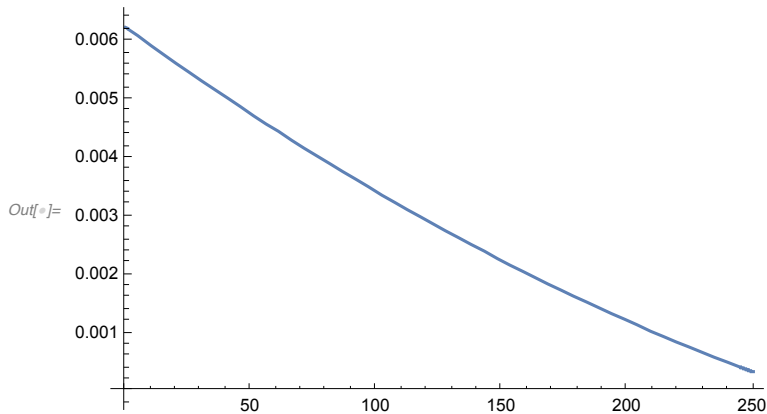
$In[\bullet]:=$ `Pb[i_, ti_, tz_, N_] :=`
`    (3 - 4 * tz / N) ^2 / N^2 * Sum[(3 - 4 * t / N) ^2, {t, ti, tz - 1}]`

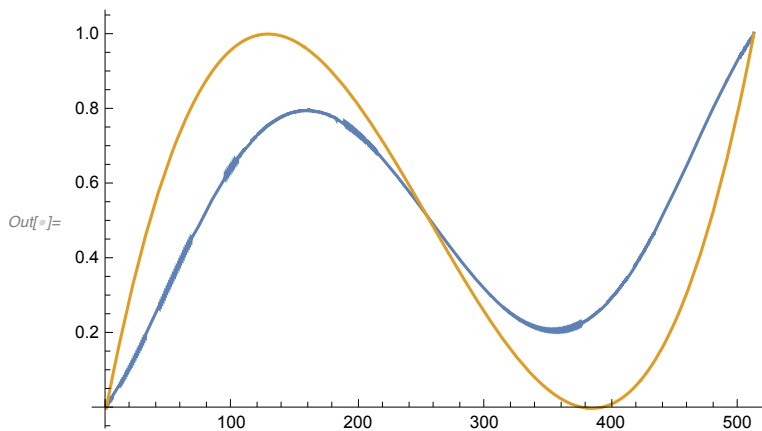$In[\bullet]:=$ `Pc[i_, ti_, tz_, N_] := (3 - 4 * tz / N) ^2 / N^2 * Sum[(1 - 4 * t / N) ^2, {t, 0, ti - 1}]`

$In[\bullet]:=$ `P[i_, ti_, tz_, N_] := Pa[i, ti, tz, N] + Pb[i, ti, tz, N] + Pc[i, ti, tz, N]`

$In[\bullet]:=$ `Plot[ P[1, ti, 250, 1024], {ti, 0, 250}]`

$In[\bullet]:=$ `Pdh[tz_, N_] := tz / N * (3 - 4 * tz / N) ^2`
`Ptot[tz_, N_] := Sum[ P[ti, ti, tz, N], {ti, 0, tz + 1}]`

`Plot[ {Ptot[tz, 512], Pdh[tz, 512]}, {tz, 0, 512}]`

$In[\bullet]:=$ `FullSimplify[Pa[1, ti, tz, N]]`

$Out[\bullet]=$ $\dfrac{(N - 4\,tz)^2\,(N - tz)\,\left(8 + 12\,N + 7\,N^2 - 4\,(6 + 5\,N)\,tz + 16\,tz^2\right)}{3\,N^6}$

$In[\bullet]:=$ `FullSimplify[Pb[1, ti, tz, N]]`

$Out[\bullet]=$ $\dfrac{1}{3\,N^6}\,(3\,N - 4\,tz)^2\,(-ti + tz)$
$\left(27\,N^2 - 36\,N\,(-1 + ti + tz) + 8\,\left(1 + ti\,(-3 + 2\,ti) - 3\,tz + 2\,ti\,tz + 2\,tz^2\right)\right)$

$In[\bullet]:=$ `FullSimplify[Pc[1, ti, tz, N]]`

$Out[\bullet]=$ $\dfrac{ti\,\left(8 + 12\,N + 3\,N^2 - 12\,(2 + N)\,ti + 16\,ti^2\right)\,(3\,N - 4\,tz)^2}{3\,N^6}$

```
FullSimplify[P[1, ti, tz, N]]
```

$Out[\bullet]=$ $\frac{1}{3 N^5}$ $\big(7 N^4 + 4 N^3 (3 - 54 ti + 40 tz) + 128 tz^2 (3 (-1 + ti) ti + (3 - 2 tz) tz) +$

$8 N^2 (1 + 27 (-1 + ti) ti + 24 tz + 72 ti tz - 76 tz^2) +$

$64 N tz (-9 ti^2 + ti (9 - 6 tz) + tz (-9 + 11 tz))\big)$

$In[\bullet]:=$ `FullSimplify[Ptot[tz, N]]`

$Out[\bullet]=$ $\frac{1}{3 N^5} (2 + tz)$

$(7 N^4 + 320 N (-3 + tz) tz^2 - 128 (-4 + tz) tz^3 + N^3 (-96 + 52 tz) + 8 N^2 (1 + (69 - 31 tz) tz))$

$In[\bullet]:=$ `Psimp[xz_] := xz / 3 * (7 + 320 * xz^3 - 128 * xz^4 + 52 * xz - 31 * 8 * xz^2)`

$In[\bullet]:=$ `Plot[ {Ptot[tz, 64], Pdh[tz, 64], Psimp[tz / 64]}, {tz, 0, 64}]`

$Out[\bullet]=$
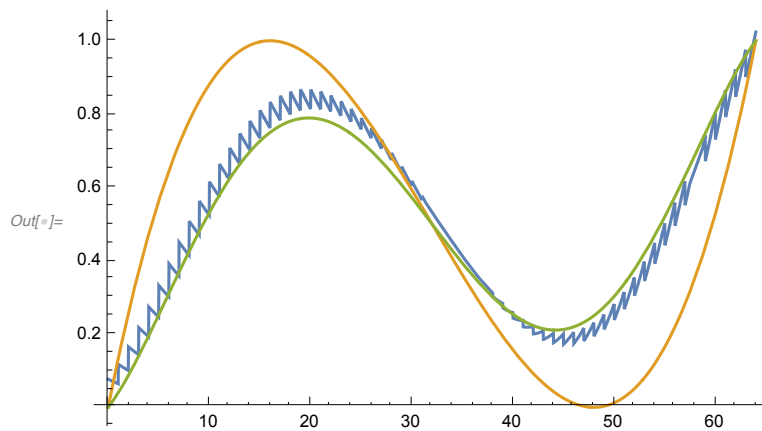
$In[\bullet]:=$ `FullSimplify[P[0, 0, tz, N]]`

$Out[\bullet]=$ $\frac{7 N^4 + 128 (3 - 2 tz) tz^3 + 64 N tz^2 (-9 + 11 tz) + 4 N^3 (3 + 40 tz) + 8 N^2 (1 + 4 (6 - 19 tz) tz)}{3 N^5}$

$In[\bullet]:=$ `FullSimplify[(1 - 4 tz / N)^2 / N^2 * Sum[(3 - 4 t / N)^2, {t, tz, N}] +`
`    (3 - 4 tz / N)^2 / N^2 * Sum[(3 - 4 t / N)^2, {t, 1, tz - 1}]]`

$Out[\bullet]=$ $\frac{1}{3 N^5}\big(7 N^4 + 128 (3 - 2 tz) tz^3 +$

$64 N tz^2 (-15 + 11 tz) + 4 N^3 (-57 + 40 tz) + N^2 (8 + 16 (51 - 38 tz) tz)\big)$

Calculando el valor medio

$In[\bullet]:=$

```
Plow[ti_, tz_, N_] := (1 - 4 tz / N)^2 / N^2 * Sum[(3 - 4 t / N)^2, {t, ti, N - 1}] +
  (1 - 4 tz / N)^2 / N^2 * Sum[(1 - 4 t / N)^2, {t, tz, ti - 1}] +
  (3 - 4 tz / N)^2 / N^2 * Sum[(1 - 4 t / N)^2, {t, 0, tz - 1}]
```

```
Plot3D[FullSimplify[Limit[N * Plow[xi * N, xz * N, N], N → Infinity]],
 {xz, 0, 1}, {xi, 0, 1}]
```

Out[ ]= $Aborted

```
mean[tz_, N_] := Sum[t * P[0, t, tz, N], {t, 0, tz - 1}] / N +
   Sum[t * Plow[t, tz, N], {t, tz, N - 1}] / N
```

```
FullSimplify[Limit[mean[x * N, N], N → Infinity]]
```

Out[ ]= $\frac{1}{2} + 16 (-1 + x)^2 x^2 (-1 + 2 x)$

Number above y when reference z has been used?
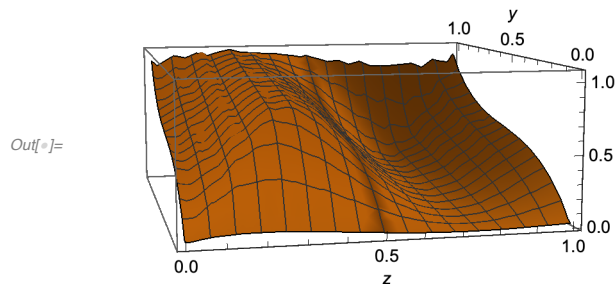
```
Psca[ti_, tz_, N_] :=
 Piecewise[{{P[0, ti, tz, N], ti < tz}, {Plow[ti, tz, N], ti ≥ tz}}]
```

```
Pabovelim[ti_, tz_, N_] := Sum[Psca[t, tz, N], {t, 0, ti}]
```

```
FullSimplify[Pabovelim[tz, tz, N]]
```

Out[ ]= $\begin{cases} \frac{7 N^4 + N^3 (12 - 56 tz) - 256 N tz^3 + 128 tz^4 + 8 N^2 (1 + tz (-3 + 23 tz))}{3 N^5} & tz \leq 0 \\ \frac{(1 + tz) (7 N^4 - 128 (-2 + tz) tz^3 + 64 N tz^2 (-6 + 5 tz) + 4 N^3 (3 + 13 tz) + 8 N^2 (1 + (15 - 31 tz) tz))}{3 N^5} & True \end{cases}$

```
Plot3D[Pabovelim[y * 100, z * 100, 100],
 {z, 0, 1}, {y, 0, 1}, AxesLabel → Automatic]
```
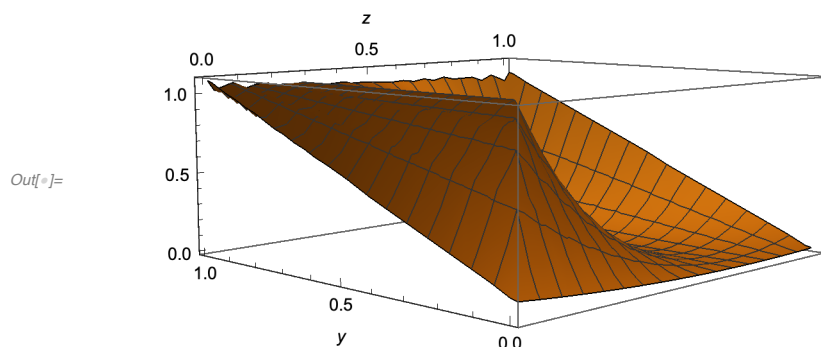
Out[ ]=

```
Plot[{Pabovelim[5, z * 100, 100], Pabovelim[25, z * 100, 100],
  Pabovelim[50, z * 100, 100], Pabovelim[75, z * 100, 100],
  Pabovelim[95, z * 100, 100]}, {z, 0, 1}, PlotLabels → {5, 25, 50, 75, 95}]
```
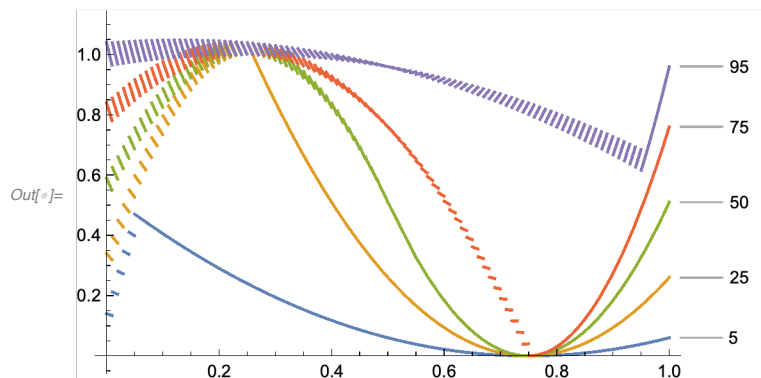
Out[ ]=
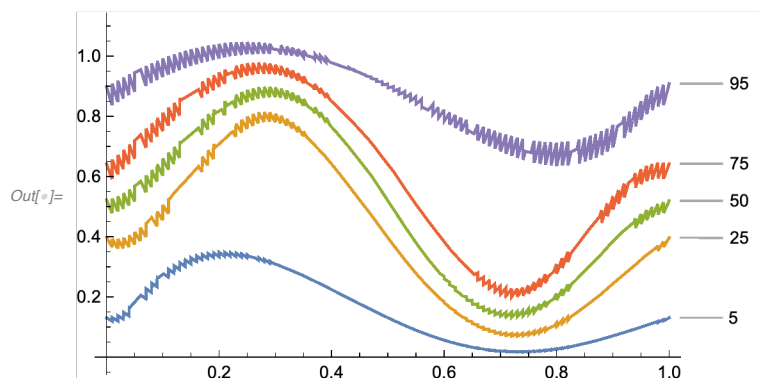
```
Pdh[ti_, tz_, N_] :=
 Piecewise[{{(3 - 4 tz / N) ^ 2 / N, ti < tz}, {(1 - 4 tz / N) ^ 2 / N, ti ≥ tz}}]

Pdhabovelim[ti_, tz_, N_] := Sum[Pdh[t, tz * N, N], {t, 0, ti}]
```
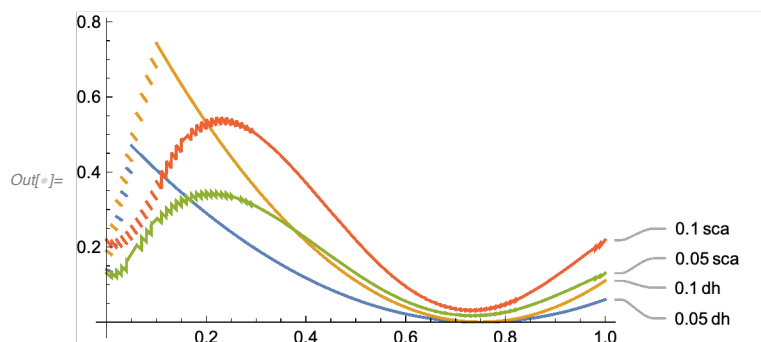
In[•]:= `Plot3D[Pdhabovelim[y * 100, z * 100, 100],`
  `{z, 0, 1}, {y, 0, 1}, AxesLabel → Automatic]`
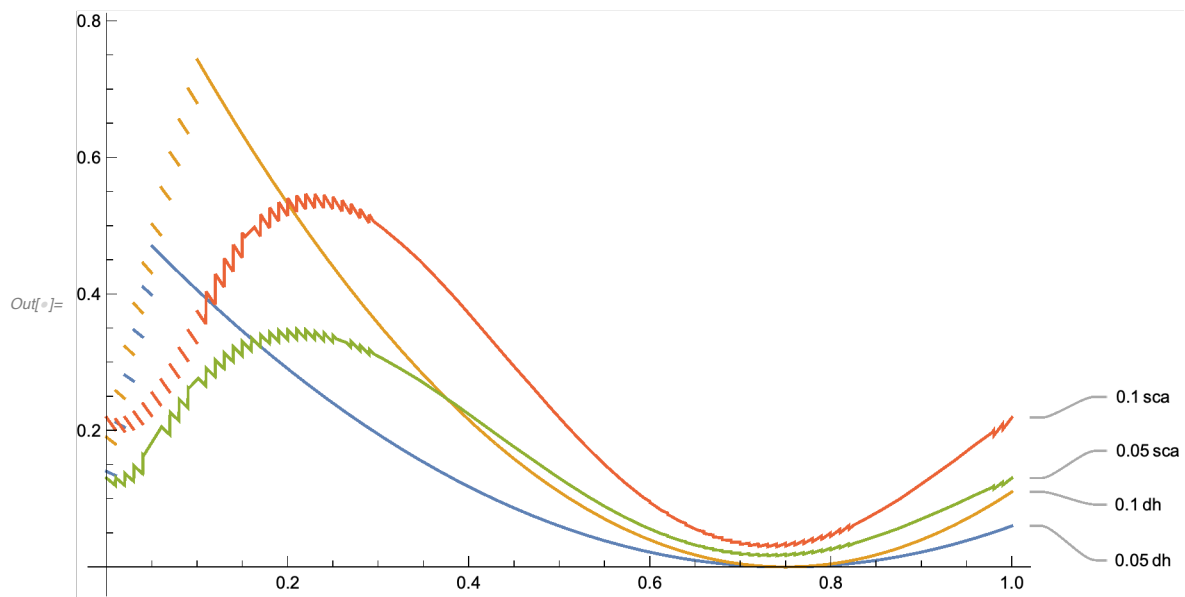
Out[•]=

`Plot[{Pdhabovelim[5, z * 100, 100], Pdhabovelim[25, z * 100, 100],`
  `Pdhabovelim[50, z * 100, 100], Pdhabovelim[75, z * 100, 100],`
  `Pdhabovelim[95, z * 100, 100]}, {z, 0, 1}, PlotLabels → {5, 25, 50, 75, 95}]`

Out[•]=

In[•]:= `Plot[{Pdhabovelim[5, z * 100, 100], Pdhabovelim[10, z * 100, 100],`
  `Pabovelim[5, z * 100, 100], Pabovelim[10, z * 100, 100]},`
  `{z, 0, 1}, PlotLabels → {.05 dh, .10 dh, .05 sca, .10 sca}]`

Out[•]=

In[ ]:= `Show[%88, ImageSize → Large]`

Out[ ]=

Calculando la probabilidad de que con un threshold z SCA encuentre un índice mejor que DHCA

In[ ]:= `Pscawin[tz_, N_] := Sum[Pdh[ti, tz, N] * Sum[Psca[tj, tz, N], {tj, 0, ti}], {ti, 0, N}]`

In[ ]:= `Plot[Pscawin[100 * x, 100], {x, 0, 1}]`

Out[ ]= `$Aborted`