

# Sensitivity indexes of the test function with fixed exponent

## Test function

```
In[37]:= f1[W_, X_, Z_] := a * Log[W] * Log[X] + b * Log[Z] * Log[X^(2)]
```

W,X,Z: U[0.5, 1.5]

P:

```
In[38]:= ClearAll[a, b]
         l = 0.5;
         h = 6.5;
         p = 1 / (h - 1);
```

## Computation of f for f1:

```
In[42]:= f0 = Simplify[p^3 * Integrate[f1[W, X, Z], {W, l, h}, {X, l, h}, {Z, l, h}]]
```

```
Out[42]= 1.17841 a + 2.35683 b
```

```
In[43]:= fw = Simplify[p^2 * Integrate[f1[W, X, Z], {X, l, h}, {Z, l, h}] - f0]
```

```
Out[43]= -1.17841 a - 4.26326 × 10-14 b + 1.08555 a Log[W]
```

```
In[44]:= fx = Simplify[p^2 * Integrate[f1[W, X, Z], {W, l, h}, {Z, l, h}] - f0]
```

```
Out[44]= -1.17841 a - 2.35683 b + 1.08555 a Log[X] + 1.08555 b Log[X2]
```

```
In[45]:= fz = Simplify[p^2 * Integrate[f1[W, X, Z], {W, l, h}, {X, l, h}] - f0]
```

```
Out[45]= 0. - 2.35683 b + 2.1711 b Log[Z]
```

```
In[46]:= fwx = Simplify[p * Integrate[f1[W, X, Z], {Z, l, h}] - f0 - fw - fx]
```

```
Out[46]= 1.17841 a + 4.26326 × 10-14 b - 1.08555 a Log[X] +
         a Log[W] (-1.08555 + 1. Log[X]) - 1.95399 × 10-14 b Log[X2]
```

```
In[47]:= fwz = Simplify[p * Integrate[f1[W, X, Z], {X, l, h}] - f0 - fw - fz]
```

```
Out[47]= 0. + 4.26326 × 10-14 b + 2.22045 × 10-16 a Log[W] - 3.90799 × 10-14 b Log[Z]
```

```
In[48]:= fxz = Simplify[p * Integrate[f1[W, X, Z], {W, 1, h}] - f0 - fx - fz]
Out[48]= 0. + 2.35683 b + 2.22045 × 10-16 a Log[X] - 2.1711 b Log[Z] + b Log[X2] (-1.08555 + 1. Log[Z])
```

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## Computation of vt, vw, vx, vz...

```
In[49]:= vt = Simplify[p^3 * Integrate[(f1[W, X, Z] - f0)^2, {W, 1, h}, {X, 1, h}, {Z, 1, h}]]
Out[49]= 1.12192 a^2 + (1.91405 - 8.19593 × 10-16 i) a b + (4.48767 - 7.57452 × 10-16 i) b^2
```

```
In[50]:= vw = Simplify[p * Integrate[(fw)^2, {W, 1, h}]]
Out[50]= 0.478514 a^2 + 6.77369 × 10-28 a b + 1.81754 × 10-27 b^2
```

```
In[51]:= vx = Simplify[p * Integrate[(fx)^2, {X, 1, h}]]
Out[51]= 0.478514 a^2 + 1.91405 a b + 1.91405 b^2
```

```
In[52]:= vz = Simplify[p * Integrate[(fz)^2, {Z, 1, h}]]
Out[52]= 1.91405 b^2
```

```
In[53]:= vwx = Simplify[p^2 * Integrate[(fwx)^2, {W, 1, h}, {X, 1, h}]]
Out[53]= (0.164889 + 5.6492 × 10-17 i) a^2 +
(5.04871 × 10-29 + 7.62306 × 10-43 i) a b + (6.20201 × 10-28 + 2.20081 × 10-43 i) b^2
```

```
In[54]:= vwz = Simplify[p^2 * Integrate[(fwz)^2, {W, 1, h}, {Z, 1, h}]]
Out[54]= 7.81209 × 10-32 a^2 + (1.01002 × 10-31 + 8.75719 × 10-45 i) a b + (6.20201 × 10-28 + 2.20081 × 10-43 i) b^2
```

```
In[55]:= vxz = Simplify[p^2 * Integrate[(fxz)^2, {X, 1, h}, {Z, 1, h}]]
Out[55]= 7.81209 × 10-32 a^2 + (3.98358 × 10-31 - 1.67645 × 10-31 i) a b + (0.659557 + 2.25968 × 10-16 i) b^2
```

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## Computation of Sw, Sx, Sz...

```
In[56]:= a = -8;
b = 1.7;
```

```
In[58]:= sw = vw/vt
Out[58]= 0.521355 - 7.95017 × 10-17 i
```

```
In[59]:= sx = vx/vt
Out[59]= 0.172373 - 2.62853 × 10-17 i
```

```
In[60]:= sz = vz/vt
Out[60]= 0.0941698 - 1.436 × 10-17 i
```

```
In[61]:= swx = vwx/vt
Out[61]= 0.179652 + 3.41545 × 10-17 i
```

In[62]:= **swz = vwz / vt**

Out[62]=  $3.05751 \times 10^{-29} + 4.13787 \times 10^{-45} i$

In[63]:= **sxz = vxz / vt**

Out[63]=  $0.0324496 + 6.16916 \times 10^{-18} i$

In[64]:= **swxz = (vt - vw - vx - vz - vwx - vwz - vxz) / vt**

Out[64]=  $4.70543 \times 10^{-14} + 7.98233 \times 10^{-17} i$