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Edition 2017

Thème : Calcul d' erreur, § 3 Partie pratique
Lien vers les énoncés des exercices :
https://www.deleze.name/marcel/sec2/applmaths/csud/calcul_erreur/3-calcul_erreur.pdf

Corrigé de l'exercice 3 - 1

```
Needs["CalculErreur`",
```
nécessite
```
 "https://www.deleze.name/marcel/sec2/applmaths/packages/CalculErreur.m"]

r = a Cos[φ];
```
cosinus
```
var = {a, φ};

mesures = {{0.3, 27 °}};

incert = {0.02 ℝ, 1 °};

result = evalFΔf[r, var, mesures, incert]
```
{{0.267302, 0.0058507}}
```
resultArrondi[result]
```
{{0.267, 0.006}}
```
r = 0.267 ± 0.006

Clear[r]
```
efface

Corrigé de l'exercice 3 - 2

```
Needs["CalculErreur`",
```
nécessite
```
 "https://www.deleze.name/marcel/sec2/applmaths/packages/CalculErreur.m"]

ρ = m / (4/3 π r^3);

var = {r, m};

incert = {Δr → 0.02 r, Δm → 0.005 m};

gaussRel[ρ, var]
```
$$\sqrt{\frac{\Delta m^2}{m^2}+\frac{9\,\Delta r^2}{r^2}}$$
```
gaussRel[ρ, var] /. incert
```
0.060208

$\frac{\Delta\rho}{\rho} \simeq 6\times\%$

```
Clear[ρ]
```
efface

Corrigé de l'exercice 3 - 3

```
Needs["CalculErreur`",
```
nécessite
```
 "https://www.deleze.name/marcel/sec2/applmaths/packages/CalculErreur.m"]

expr1 = a b^2 / c;

var1 = {a, b, c};

mesures1 = {{1.34, 4.34, 0.027}, {1.36, 4.35, 0.025}, {1.35, 4.34, 0.026}};

incert1 = {0.03, 0.02, 0.004};

expr2 = (z1 + z2 + z3) / 3;

var2 = {z1, z2, z3};

evalF[expr1, var1, mesures1]
```
{{934.804}, {1029.38}, {978.002}}
```
valeurs2 = {Flatten[evalF[expr1, var1, mesures1]]}
```
aplatis
```
{{934.804, 1029.38, 978.002}}

incert2 = evalΔf[expr1, var1, mesures1, incert1]
```
{140.327, 166.529, 152.29}
```
result = evalFΔf[expr2, var2, valeurs2, incert2]
```
{{980.73, 88.5787}}
```
resultArrondi[result]
```
{{980., 90.}}

z = 980 ± 90

```
Clear[expr1, expr2]
```
efface

Corrigé de l'exercice 3 - 4

```
Needs["CalculErreur`",
```
nécessite
```
 "https://www.deleze.name/marcel/sec2/applmaths/packages/CalculErreur.m"]

c0 = (m1 c1 + c) (t1 - t2) / (m0 (t2 - t0));

var = {c, t1, t2};
```

gauss[c0, var]

$$\sqrt{\left(\frac{(t1-t2)^2\,\triangle c^2}{m0^2\,(-t0+t2)^2}+\frac{(c+c1\,m1)^2\,\triangle t1^2}{m0^2\,(-t0+t2)^2}+\left(-\frac{(c+c1\,m1)\,(t1-t2)}{m0\,(-t0+t2)^2}-\frac{c+c1\,m1}{m0\,(-t0+t2)}\right)^2\triangle t2^2\right)}$$

gaussRel[c0, var]

$$\sqrt{\frac{(t0-t2)^2\,(t1-t2)^2\,\triangle c^2+(c+c1\,m1)^2\,(t0-t2)^2\,\triangle t1^2+(c+c1\,m1)^2\,(t0-t1)^2\,\triangle t2^2}{(c+c1\,m1)^2\,(t0-t2)^2\,(t1-t2)^2}}$$

notation =
{m0 → m_0, m1 → m_1, c1 → c_1, t0 → T_0, t1 → T_1, t2 → T_2, c → C, ∆c → ∆C, ∆t1 → ΔT_1, ∆t2 → ΔT_2};
constante C

gauss[c0, var] /. notation

$$\sqrt{\frac{\triangle C^2\,(T_1-T_2)^2}{m_0^2\,(-T_0+T_2)^2}+\frac{(C+c_1\,m_1)^2\,\triangle T_1^2}{m_0^2\,(-T_0+T_2)^2}+\left(-\frac{(C+c_1\,m_1)\,(T_1-T_2)}{m_0\,(-T_0+T_2)^2}-\frac{C+c_1\,m_1}{m_0\,(-T_0+T_2)}\right)^2\triangle T_2^2}$$

gaussRel[c0, var] /. notation

$$\sqrt{\frac{\triangle C^2\,(T_0-T_2)^2\,(T_1-T_2)^2+(C+c_1\,m_1)^2\,(T_0-T_2)^2\,\triangle T_1^2+(C+c_1\,m_1)^2\,(T_0-T_1)^2\,\triangle T_2^2}{(C+c_1\,m_1)^2\,(T_0-T_2)^2\,(T_1-T_2)^2}}$$

Clear[c0]
efface