

In[1]:= **Iin[t_] = A Cos[fz * t] + B Cos[fo * t];**

In[2]:= **Il[t_] = Cs Sin[fz * t - fo * t] + Cc Cos[fz * t - fo * t];**

In[3]:= **Uu[t_] = (L0 + a (Iin[t] - Il[t])) (Iin'[t] - Il'[t]) // TrigReduce**

Out[3]=
$$\begin{aligned} & \frac{1}{2} a A C s f o C o s[f o t] - \frac{1}{2} a B C s f z C o s[f z t] + \frac{1}{2} a A C s f o C o s[f o t - 2 f z t] - a A C s f z C o s[f o t - 2 f z t] - \\ & a C c C s f o C o s[2 f o t - 2 f z t] + a C c C s f z C o s[2 f o t - 2 f z t] + C s f o L 0 C o s[f o t - f z t] - \\ & C s f z L 0 C o s[f o t - f z t] + a B C s f o C o s[2 f o t - f z t] - \frac{1}{2} a B C s f z C o s[2 f o t - f z t] + \\ & \frac{1}{2} a A C c f o S i n[f o t] - B f o L 0 S i n[f o t] - \frac{1}{2} a B^2 f o S i n[2 f o t] + \frac{1}{2} a B C c f z S i n[f z t] - \\ & A f z L 0 S i n[f z t] - \frac{1}{2} a A^2 f z S i n[2 f z t] + \frac{1}{2} a A C c f o S i n[f o t - 2 f z t] - a A C c f z S i n[f o t - 2 f z t] - \\ & \frac{1}{2} a C c^2 f o S i n[2 f o t - 2 f z t] + \frac{1}{2} a C s^2 f o S i n[2 f o t - 2 f z t] + \frac{1}{2} a C c^2 f z S i n[2 f o t - 2 f z t] - \\ & \frac{1}{2} a C s^2 f z S i n[2 f o t - 2 f z t] - \frac{1}{2} a A B f o S i n[f o t - f z t] + \frac{1}{2} a A B f z S i n[f o t - f z t] + \\ & C c f o L 0 S i n[f o t - f z t] - C c f z L 0 S i n[f o t - f z t] + a B C c f o S i n[2 f o t - f z t] - \\ & \frac{1}{2} a B C c f z S i n[2 f o t - f z t] - \frac{1}{2} a A B f o S i n[f o t + f z t] - \frac{1}{2} a A B f z S i n[f o t + f z t] \end{aligned}$$

In[4]:= **Coefficient[Uu[t] // TrigReduce, Cos[fz t]]**
x = (Coefficient[Uu[t] // TrigReduce, Sin[fo * t - fz * t]] -
Coefficient[Uu[t] // TrigReduce, Sin[-fo * t + fz * t]])
y = (Coefficient[Uu[t] // TrigReduce, Cos[fo * t - fz * t]] +
Coefficient[Uu[t] // TrigReduce, Cos[-fo * t + fz * t]])

Out[4]= $-\frac{1}{2} a B C s f z$

Out[5]= $-\frac{1}{2} a A B f o + \frac{1}{2} a A B f z + C c f o L 0 - 2 C c f z L 0$

Out[6]= $2 C s f o L 0 - 2 C s f z L 0$

In[7]:= **Cs[fz_, fo_, A_, B_, r_, L0_, a_] = Cs /. Solve[{r Cs == x, r Cc == y}, {Cs, Cc}][[1]]**
Cc[fz_, fo_, A_, B_, r_, L0_, a_] = Cc /. Solve[{r Cs == x, r Cc == y}, {Cs, Cc}][[1]]

Out[7]= $-\frac{(a A B f o - a A B f z) r}{2 (-2 f o^2 L 0^2 + 6 f o f z L 0^2 - 4 f z^2 L 0^2 + r^2)}$

Out[8]= $\frac{a A B (f o - f z)^2 L 0}{2 f o^2 L 0^2 - 6 f o f z L 0^2 + 4 f z^2 L 0^2 - r^2}$

In[9]:= **Puit[fz_, fo_, A_, B_, r_, L0_, a_] =**
r / 2 (Cs[fz, fo, A, B, r, L0, a]^2 + Cc[fz, fo, A, B, r, L0, a]^2) // FullSimplify;

In[10]:= **Pin[fz_, fo_, A_, B_, r_, L0_, a_] = 0.5 (a B A C s[fz, fo, A, B, r, L0, a] f z) // FullSimplify**

Out[10]= $-\frac{0.25 a^2 A^2 B^2 (f o - f z) f z r}{-2 (f o - 2 f z) (f o - f z) L 0^2 + r^2}$

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In[11]:= rend[fz_, fo_, A_, B_, r_, L0_, a_] =  
    Puit[fz, fo, A, B, r, L0, a] / Pin[fz, fo, A, B, r, L0, a] // FullSimplify
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$$\text{Out[11]} = -\frac{0.5 (fo - fz) (4 (fo - fz)^2 L0^2 + r^2)}{fz (-2 (fo - 2 fz) (fo - fz) L0^2 + r^2)}$$

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In[12]:= rend[fz, fo, A, B, r, L0, a]
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$$\text{Out[12]} = -\frac{0.5 (fo - fz) (4 (fo - fz)^2 L0^2 + r^2)}{fz (-2 (fo - 2 fz) (fo - fz) L0^2 + r^2)}$$

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In[13]:= Plot[{Abs[rend[x, 10, 1, 1, 1, 1, 0.1]], 20 Abs[rend[x, 10, 1, 0.1, 1, 0, 0.1]]},  
    {x, 0, 20}, PlotRange -> {0, 20}]
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