so $2x\underset{\sim}{i} = 2\lambda_1 \underset{\sim}{i}$

$2\underset{\sim}{j} = -\lambda_1 \underset{\sim}{j} + \lambda_2 \underset{\sim}{j}$

$-2z\underset{\sim}{k} = \lambda_2 \underset{\sim}{k}$

which, along with our two constraints, gives us Five equations

① $2x = 2\lambda_1$

② $2 = -\lambda_1 + \lambda_2$

③ $-2z = \lambda_2$

④ $2x - y = 0$

⑤. $y + z = 0$

Rearrange ① to get $\lambda_1 = x$ and substitute for λ_1 in ② & ③.

② becomes $2 = -x + \lambda_2$ and ③ ~~becomes~~ is unchanged.

Rearranging ② gives us $\lambda_2 = 2 + x$, which we substitute into ③, to get $-2z = 2 + x$. Rearranging this, we get an expression for z in terms of x alone, $z = -\frac{1}{2}x - 1$

Now let's rearrange ④ to get y in terms of x. $y = 2x$.

So, substituting for y and z in equation ⑤, we end up with

$2x - \frac{1}{2}x - 1 = 0$. This reduces to $\frac{3}{2}x = 1$ or $x = \frac{2}{3}$.

If $y = 2x$, y must be $\frac{4}{3}$ and if $z = -\frac{1}{2}x - 1$, z must be $-\frac{4}{3}$.

Hence, the maximum occurs at $\left(\frac{2}{3}, \frac{4}{3}, -\frac{4}{3}\right)$.

The question asks us to maximize the function, so we must calculate F at $\left(\frac{2}{3}, \frac{4}{3}, \frac{-4}{3}\right)$.

$$F\left(\frac{2}{3}, \frac{4}{3}, \frac{-4}{3}\right) = \frac{4}{9} + \frac{8}{3} - \frac{16}{9} = \frac{4}{9} + \frac{24}{9} - \frac{16}{9} = \frac{12}{9} = \frac{4}{3}$$