If the roots of the equation $10x^2 - 83x + 117 = 0$ are $x_1$ and $x_2$, find the equation satisfied by $-4x_1$ and $-4x_2$.

**Solution:**
From Vieta’s formulas we have that

$$x_1x_2 = \frac{117}{10}$$

and

$$x_1 + x_2 = \frac{83}{10}.$$  

Therefore

$$(-4x_1)(-4x_2) = 16x_1x_2 = 16 \cdot \frac{117}{10} = \frac{936}{5}$$

and

$$-4x_1 - 4x_2 = -4(x_1 + x_2) = -4 \cdot \frac{83}{10} = -\frac{166}{5}.$$  

Therefore the equation satisfied by $-4x_1$ and $-4x_2$ is

$$y^2 - \frac{166}{5}y + \frac{936}{5} = 0$$

or

$$5y^2 - 166y + 936 = 0.$$  

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