Solve the following :

$$\int_{x=0}^{\pi/4} cos2x\,\sqrt{4-sin2x}\,dx$$

Let $u = sin2x$, then

$$du = 2cos2x\,dx$$

$$\frac{du}{2cos2x} = dx$$

Substituting the vaule back into the original integral, we get

$$\int_{x=0}^{\pi/4} cos2x\,\sqrt{4-u}\,\frac{du}{2cos2x}$$

$$\frac{1}{2}\int_{x=0}^{\pi/4} \sqrt{4-u}\,du$$

$$\frac{1}{2}\int_{x=0}^{\pi/4} (4-u)^{\frac{1}{2}}\,du$$

$$\left[-\frac{1}{2} * \frac{(4-u)^{(\frac{1}{2}+1)}}{(\frac{1}{2}+1)} + C\right]_0^{\frac{\pi}{4}}$$

$$\left[-\frac{1}{2} * \frac{2}{3}(4-u)^{(}\frac{3}{2}) + C\right]_0^{\frac{\pi}{4}}$$

$$\left[-\frac{1}{3}(4-u)^{(}\frac{3}{2}) + C\right]_0^{\frac{\pi}{4}}$$

Substituting the value for u back into the solution we get

$$\left[-\frac{1}{3}(4-sin2x)^{(}\frac{3}{2}) + C\right]_0^{\frac{\pi}{4}}$$

$$(-\frac{1}{3}(4-sin\frac{\pi}{2})^{(}\frac{3}{2})) + C - (-\frac{1}{3}(4-sin0)^{(}\frac{3}{2}) + C)$$

$$(-\frac{1}{3}(4-1)^{(}\frac{3}{2})) + C - (-\frac{1}{3}(4-0)^{(}\frac{3}{2}) + C)$$

$$(-\frac{1}{3}(3)^{(}\frac{3}{2})) + C - (-\frac{1}{3}(4)^{(}\frac{3}{2}) + C)$$

$$(-3^{(}\frac{3}{2}-1) + C - (-\frac{8}{3} + C)$$

$$(-3^{(}\frac{1}{2}) + C + \frac{8}{3} - C$$

$$\frac{8}{3} - \sqrt{3}$$