

$$\cos^4(x) = [\cos^2(x)]^2$$

$$= \left[\frac{1 + \cos(2x)}{2} \right]^2$$

$$= \frac{[1 + \cos(2x)]^2}{4}$$

$$= \frac{1}{4} [1 + \cos(2x)]^2$$

Let $u = 2x$

$$= \frac{1}{4} [1 + \cos(u)]^2$$

Remember: $(2)(1)(+\cos(u))$

$$= \frac{1}{4} [1 + 2\cos(u) + \cos^2(u)]$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$= \frac{1}{4} \left[1 + 2\cos(u) + \frac{1 + \cos(2u)}{2} \right]$$

$$= \frac{1}{4} \left[1 + 2\cos(u) + \frac{1+\cos(2u)}{2} \right]$$

Sub back: $u = 2x$

$$= \frac{1}{4} \left[1 + 2\cos(2x) + \frac{1+\cos(4x)}{2} \right]$$

$$= \frac{1}{4} \left[1 + 2\cos(2x) + \frac{1}{2} + \frac{\cos(4x)}{2} \right]$$

$$= \frac{1}{4} \left[\frac{3}{2} + 2\cos(2x) + \frac{\cos(4x)}{2} \right]$$

$$= \left[\frac{3}{8} + \frac{1}{2}\cos(2x) + \frac{1}{8}\cos(4x) \right]$$