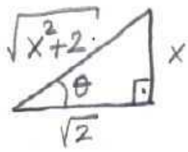
3. Evaluate $\int \frac{x^4+4x^2+3x+4}{x^5+4x^3+4x}\,dx = \int \frac{x^4+4x^2+3x+4}{x(x^4+4x^2+4)}\,dx$

$$= \int \left(\frac{1}{x} + \frac{3}{\underbrace{x^4+4x^2+4}_{(x^2+2)^2}} \right) dx$$

where $I_1 = \int \frac{dx}{x} = \ln|x| + c_1$, and

$$I_2 = \int \frac{dx}{(x^2+2)^2} \underset{x=\sqrt{2}\tan\theta}{=\!=} \int \frac{\sqrt{2}\sec^2\theta\, d\theta}{4\sec^4\theta} = \frac{\sqrt{2}}{4}\int \underbrace{\cos^2\theta}_{\frac{1}{2}(1+\cos 2\theta)}\, d\theta$$



$$= \frac{\sqrt{2}}{8}\left(\theta + \underbrace{\frac{\sin 2\theta}{2}}_{\sin\theta\cos\theta} \right) +$$

$$= \frac{\sqrt{2}}{8}\left(\tan^{-1}\frac{x}{\sqrt{2}} + \frac{\sqrt{2}\,x}{x^2+2} \right) +$$

Thus, $\int \frac{x^4+4x^2+3x+4}{x^5+4x^3+4x}\,dx = \ln|x| + \frac{3\sqrt{2}}{8}\left(\tan^{-1}\frac{x}{\sqrt{2}} + \frac{\sqrt{2}\,x}{x^2+2} \right)$