5. Evaluate the folowing integrals.

a. $\int \frac{\tan^2 x}{1+\sin x}\, dx = \int \frac{\tan^2 x}{1-\sin^2 x} \cdot (1-\sin x)\, dx = \int \frac{\tan^2 x}{\cos^2 x} \cdot (1-\sin x)\, dx$

$= \int \tan^2 x \sec^2 x\, dx - \int \tan^3 x \sec x\, dx$

$= \int \tan^2 x\, d(\tan x) - \int (\sec^2 x - 1) \tan x \sec x\, dx$

$= \frac{1}{3}\tan^3 x - \int (\sec^2 x - 1)\, d(\sec x)$

$= \frac{1}{3}\tan^3 x - \frac{1}{3}\sec^3 x + \sec x + C$

b. $\int_1^8 \sqrt{4 - \frac{3}{x^2} + \frac{1}{x^3}}\, dx = \int_1^8 \left(\left(1+\frac{1}{x}\right)\left(2-\frac{1}{x}\right)^2 \right)^{1/2} dx$

$= \int_1^8 (1+x^{-1})^{1/2} (2-x^{-1})\, dx = \int_1^8 (x^{2/3}+x^{-1/3})^{1/2} (2x^{-1/3} - x^{-4/3})\, dx$

$= 3\int_1^8 (x^{2/3}+x^{-1/3})^{1/2}\, d(x^{2/3}+x^{-1/3}) = 3 \cdot \left.\frac{(x^{2/3}+x^{-1/3})^{3/2}}{3/2}\right]_1^8$

$= 2 \cdot \left(\frac{9}{2}\right)^{3/2} - 2 \cdot 2^{3/2} = \frac{19}{\sqrt{2}}$