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Sub for A and $\sqrt{E}$ in ①

$$\Theta = \frac{2\sqrt{2m}}{3a\,I^{1/3}}\left(\frac{3\pi a}{2\sqrt{2m}}\right)^{2/3}\left(\frac{3\pi a}{2\sqrt{2m}}\right)^{1/3} I^{1/3}\left(1-\sqrt{1-aq/E}\right)$$

$$= \frac{2\sqrt{2m}}{3aI^{1/3}} \cdot \frac{3\pi a}{2\sqrt{2m}} I^{1/3}\left(1-\sqrt{1-aq/E}\right)$$

$$= \pi\left(1-\sqrt{1-aq/E}\right)$$

ie $\Theta = \pi\left(1-\sqrt{1-aq/E}\right)$

$$\frac{\Theta}{\pi} = 1-\sqrt{1-aq/E}$$

$$\sqrt{1-aq/E} = 1-\frac{\Theta}{\pi}$$

$$1-aq/E = \left(1-\frac{\Theta}{\pi}\right)^2 = 1-\frac{2\Theta}{\pi}+\frac{\Theta^2}{\pi^2}$$

$$-\frac{aq}{E} = -\frac{2\Theta}{\pi}+\frac{\Theta^2}{\pi^2}$$

$$q = \frac{E}{a}\left(\frac{2\Theta}{\pi}-\frac{\Theta^2}{\pi^2}\right) \checkmark$$

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$E = AI^{2/3}$

$$\therefore q(\Theta, I) = \frac{AI^{2/3}}{a}\left(\frac{2\Theta}{\pi}-\frac{\Theta^2}{\pi^2}\right)$$

How do you justify the form of the Fourier Series given ie that the sine terms are missing?

$q(\theta)$ is even f^n.

b) $$Q_0 = \frac{1}{\pi}\int_0^{\pi} q(\Theta, I)\,d\Theta$$

$$= \frac{1}{\pi}\int_0^{\pi} I^{2/3}\frac{A}{a}\left(\frac{2\Theta}{\pi}-\frac{\Theta^2}{\pi^2}\right)d\Theta$$

$$= \frac{I^{2/3}A}{\pi a}\int_0^{\pi} \frac{2\Theta}{\pi}-\frac{\Theta^2}{\pi^2}\,d\Theta$$

$$= \frac{I^{2/3}A}{\pi a}\left[\frac{\Theta^2}{\pi}-\frac{\Theta^3}{3\pi^2}\right]_0^{\pi}$$

$$= \frac{I^{2/3}A}{\pi a}\left(\left[\frac{\pi^2}{\pi}-\frac{\pi^3}{3\pi^2}\right]-\left[0-0\right]\right)$$

$$= \frac{2I^{2/3}A}{3a} = \frac{2AI^{2/3}}{3a}$$

$$q(\Theta, I) = I^{2/3}\frac{A}{a}\left(\frac{2\Theta}{\pi}-\frac{\Theta^2}{\pi^2}\right)$$

$$= \frac{I^{2/3}A}{a}\cdot\frac{\Theta}{\pi}\left(2-\frac{\Theta}{\pi}\right)$$

PTO