14.1

$$E \approx 2E_F - 2E_c e^{-2/N_F V}$$

Expanding this means expanding $e^{-2/N_F V}$

$$e^{-1/x} = 1 - \frac{1}{x} + \frac{1}{2x^2} - \frac{1}{6x^3} + \dots$$

(where $\frac{1}{x} = \frac{2}{N_F V}$)

Around $V = 0$, $x = 0$. but then $\frac{1}{x}$ explodes?

?

14.2

$$IV = mgv$$

$$V = n\frac{h}{2e}f$$

$$\left.\begin{array}{l} R_H = \frac{1}{i}\frac{h}{e^2} \\ V = IR \end{array}\right\} \Rightarrow I = \frac{V}{R} = \frac{V i e^2}{h}$$

$$\left(\frac{V i e^2}{h}\right) V = mgv$$

$$\Rightarrow \left(\frac{nhf}{2e}\right)^2 \left(\frac{ie^2}{h}\right) = mgv$$

$$\frac{i\,n^2}{vg\,4} f^2 = m$$

v ⟶ $\frac{\text{distance}}{\text{time}}$ } defined via speed of light c and time (using ΔV_{Cs})

14.3

1 Flux quantum $= 2.07 \times 10^{-7}\ G\ cm^2$

Through a $1\ cm^2$ area, Field $H = 2.07 \times 10^{-7}\ G$

$= 2.07 \times 10^{-11}\ T$

Field from a wire with current I is $\frac{\mu_0 I}{2\pi r} = \frac{1.0}{2\pi r}\mu_0$

$$\frac{\mu_0 1.0}{2\pi r} = 2.07 \times 10^{-11}$$

$\Rightarrow r = 10^3\ m$ (That's huge!!)

1.4

$Z_R = R$

$Z_L = i\omega L$

$Z_C = \frac{1}{i\omega C}$

$$Z_{total} = R + i\omega L + \frac{1}{i\omega C_e} + \frac{1}{i\omega C_m}$$