Quiz 3

Eliott Bergerson
PHYS 330

1) a) $\vec{v} = a\hat{x} + b\hat{y} + c\hat{z}$

B: $\vec{v} \cdot \hat{z}$

a(0) b(0) c(1)

Fourier's Trick: $\hat{x}_i \cdot \hat{x}_j = 0$

$\hat{x}_i \cdot \hat{x}_2 = 1$

$\vec{v} \cdot \hat{z} = \hat{z}(a\hat{x} + b\hat{y} + c\hat{z})$

$\vec{v} \cdot \hat{z} = c$

b) $\vec{x} = \sum_{i=1}^{n} c_i \hat{x}_i = c_7$

D: $\hat{x}_7 \cdot \vec{x}$

Fourier's Trick: $\vec{v} \cdot \hat{x}_m = \sum_{i=1}^{n} c_n \hat{x}_i \cdot \hat{x}_m = c_m$

$\vec{v} \cdot \hat{x}_7 = \sum_{i=1}^{n} c_i \cdot \hat{x}_i \cdot \hat{x}_7 = c_7$

c) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \sin(nx) + b_n \cos(nx)$ $\quad f(x) = \sin(3x)$

$n = 0$ to $n = \infty$

$a_n = \frac{1}{\pi}\int_0^{\pi\pi} f(x)\sin(nx)\,dx$ $\quad b_n = \frac{1}{\pi}\int_0^{\pi} f(x)\cos(nx)\,dx$

$a_n = \frac{1}{\pi}\cos(nx)\Big|_{\pi}^{0} = \frac{1}{\pi}(\cos(0) - \cos(n\pi))$

$b_n = \frac{1}{\pi}\sin(nx)\Big|_{0}^{\pi} = 0$ for all numbers

even = 0
odd = $2/\pi$

2) a) $V(x,y,z) \to 0 \quad y \to \infty$ $\boxed{B: Y(y) = \sinh(x)}$ $\sinh(\infty) = \infty$

$\infty \neq 0$

b) Eq 3.50 $V_0(y,z) = V_0$ $C_{n,m} = \frac{4V_0}{ab}\int_0^a\int_0^a \sin(n\pi y/a)\sin(n\pi z/a)\,dy\,dz$

Reproduce 3.51

$n = ODD = \frac{16V_0}{\pi^2 nm}$

$\frac{4V_0}{ab}\int_0^a \sin\frac{3\pi y}{a})dy \cdot \int_0^b \sin\left(\frac{3\pi z}{b}\right)dz$

$\frac{4V_0}{ab}\cdot\frac{2a}{3\pi}\cdot\frac{2b}{3\pi} = \boxed{\frac{16V_0}{9\pi}}$

$n = \underline{Even} = 0$

$\frac{4V_0}{ab}\cdot\int_0^a \sin\left(\frac{2\pi y}{a}\right)dy \cdot \int_0^b \sin\left(\frac{2\pi z}{b}\right)dz$

$\frac{4V_0}{ab}\cdot 0\cdot 0 = \boxed{0}$