HOMEWORK 4 : NINA CHALGERI

① (a) · $t = 0$

$D(A) = 0 \qquad D(T) = 50$

· $t = 1/4 \Rightarrow$ A gets to 50 mi

$D(A) = 50 \qquad D(T) = \frac{250}{4}$

· $t = 5/16$

$D(A) = \frac{250}{4} \qquad D(T) = \frac{1056}{16}$

· Keeps going...

$\Rightarrow$ Zeno's paradox tells us that at every fractional time, T will always be slightly more ahead

(b) $200t = 50 + 50t$

$150t = 50$

$\boxed{t = 1/3}$

(c) $\frac{1}{4}\sum_{n=0}^{\infty} \left(\frac{1}{4}\right)^n \Rightarrow \frac{1}{4}\left(\frac{1}{3/4}\right) = \frac{1}{3}$ ✓

(d)

t	$D(A)$	$D(T)$
0	0	50
1/4	50	50 + 50/4
6/16	50 + 50/4	50 + 50/4 + 50/16
21/64	50 + 50/4 + 50/16	50 + 50/4 + 50/16 + 50/64

② $(1-x)(1 + x + x^2 + \cdots + x^n) = \frac{1 - x^{n+1}}{1-x}\,(1-x)$

$1 - x + x - x^2 + x^2 - x^3 + \cdots - x^n + x^n - x^{n+1} = 1 - x^{n+1}$

$1 - x^{n+1} = 1 - x^{n+1}$ ✓