Exercise #13

Let t = time since insulin injected (minutes)
I_t = Units of insulin in blood t minutes since injection.

(a) It looks like the half-life of insulin is about 5 minutes

(b)

t	I_t	I_t/I_{t-1}
0	10	
1	8.9	0.89
2	7.6	0.85
3	6.6	0.87
4	5.9	0.89
5	5	0.85

I choose 0.87 as my "typical" ratio

My Difference Equation:
$I_0 = 10$
$I_t = 0.87 I_{t-1}$

My Functional Equation: $I_t = 10(0.87)^t$

(c)

t	0	1	2	3	4	5
I_t	10	8.9	7.6	6.6	5.9	5
Model	10	8.9	7.9	7.0	6.3	5.9
Error	0	0	.3	.4	.4	.9

My average error is 0.33

(d) 10 is the initial amount of insulin injected, add 0.87 is the amount remaining from the previous minute. So, the amount is decaying at about 13% per minute.

(e) Based on the graph we would expect the following as reasonable approximations.

(i) $10(0.9)^0 \approx 10 \iff$ Initial amount of insulin in blood

(ii) $10(0.9)^5 \approx 5 \iff$ Amount remaining after 5 minutes

(iii) $10(0.9)^{10} \approx 1.2 \iff$ Amount remaining after 10 minutes

(f)

t	0	0.5	1.5	2.5	3.5	4.5	5.5	6.5
I_t	10	9.5	8.5	7.7	6.9	6.2	5.6	5.0