Homework: Conservation

5.1, 5.3

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5.1

Table 1 shows vehicle counts from the Lincoln Tunnel's 1.5-mile long south tunnel. The counts are binned by hour over a 24-hour period, and are for both entering and exiting vehicles.

The level of service (LOS) of the tunnel is determined by the density, as shown in Table 3.

For each hour, the density is calculated from the number of vehicles in the tunnel. This is given by the difference in cumulative entering vehicles and cumulative exiting vehicles. The tunnel is 1.5 miles in length and has 2 lanes, so the density per lane is given by $k_l = \frac{N_{\text{tunnel}}}{1.5 \times 2}$. Table 5 shows this for each hour.

5.3

Table 1: Lincoln Tunnel Vehicle Counts

Time	Vehicles Entering	Vehicles Exiting
00:00	0	0
01:00	90	80
02:00	400	390
03:00	900	874
04:00	1,860	1,870
05:00	2,060	2,028
06:00	2,200	2,210
07:00	3,000	2,978
08:00	4,060	4,026
09:00	4,200	4,154
10:00	3,207	3,223
11:00	3,386	3,424
12:00	2,810	2,832
13:00	3,019	3,029
14:00	3,880	3,838
15:00	3,665	3,637
16:00	4,020	3,980
17:00	4,600	4,634
18:00	4,282	4,316
19:00	3,740	3,772
20:00	3,120	3,138
21:00	1,680	1,706
22:00	408	438
23:00	0	10

Table 3: LOS of Highway Segment

LOS	Density (veh/mi/lane)
A	11
B	11–18
C	18–26
D	26–35
E	35–45
F	> 45

Table 5: Density and LOS Calculations for Lincoln Tunnel

Time	Cumulative Vehicles Entering	Cumulative Vehicles Exiting	Vehicles In Tunnel (En−Ex)	Density (veh/mi)	Lane Density (veh/mi/lane)	Level of Service
00:00	0	0	0	0.00	0.00	A
01:00	90	80	10	6.67	3.33	A
02:00	490	470	20	13.33	6.67	A
03:00	1,390	1,344	46	30.67	15.33	B
04:00	3,250	3,214	36	24.00	12.00	B
05:00	5,310	5,242	68	45.33	22.67	C
06:00	7,510	7,452	58	38.67	19.33	C
07:00	10,510	10,430	80	53.33	26.67	D
08:00	14,570	14,456	114	76.00	38.00	E
09:00	18,770	18,610	160	106.67	53.33	F
10:00	21,977	21,833	144	96.00	48.00	F
11:00	25,363	25,257	106	70.67	35.33	E
12:00	28,173	28,089	84	56.00	28.00	D
13:00	31,192	31,118	74	49.33	24.67	C
14:00	35,072	34,956	116	77.33	38.67	E
15:00	38,737	38,593	144	96.00	48.00	F
16:00	42,757	42,573	184	122.67	61.33	F
17:00	47,357	47,207	150	100.00	50.00	F
18:00	51,639	51,523	116	77.33	38.67	E
19:00	55,379	55,295	84	56.00	28.00	D
20:00	58,499	58,433	66	44.00	22.00	C
21:00	60,179	60,139	40	26.67	13.33	B
22:00	60,587	60,577	10	6.67	3.33	A
23:00	60,587	60,587	0	0.00	0.00	A