

Math 75B Selected Homework Solutions

Completeness:	15
Format:	10
Total:	25 points

19-A(2) #5, 6
19-B #1, 2, 5(a)
19-C #2, 3
5.1 #2, 8, 10
20-C #2, 4
5.3 #5, 14, 22

§5.1 #10. Use the data below to estimate the height of the space shuttle above the earth 62 seconds after liftoff.

Event	Time (s)	Velocity (ft./s)
Launch	0	0
Begin roll maneuver	10	185
End roll maneuver	15	319
Throttle to 89%	20	447
Throttle to 67%	32	742
Throttle to 104%	59	1325
Maximum dynamic pressure	62	1445
Solid rocket booster separation	125	4151

Similar to the example done in class, we will estimate the distance traveled by pretending that the velocity given at the **end** of each time interval was the velocity for the whole time interval (this would be a *right endpoints* method).

We have

$$\begin{aligned}\text{distance} &= 185 \cdot 10 + 319 \cdot 5 + 447 \cdot 5 + 742 \cdot 12 + 1325 \cdot 27 + 1445 \cdot 3 \\ &= 54,694 \text{ ft.} \approx \boxed{10.4 \text{ mi.}}\end{aligned}$$

If you want you can do the same thing with the velocities at the **beginning** of each time interval (i.e. *left endpoints*) instead. Or you can do both and take the average!

Using left endpoints we get

$$\begin{aligned}\text{distance} &= 0 \cdot 10 + 185 \cdot 5 + 319 \cdot 5 + 447 \cdot 12 + 742 \cdot 27 + 1325 \cdot 3 \\ &= 31,893 \text{ ft.} \approx 6.0 \text{ mi.}\end{aligned}$$

Then the average is 43,293.5 ft., or approximately 8.2 mi.

§5.3 #14. Evaluate the integral $\int_1^9 \frac{3x-2}{\sqrt{x}} dx$.

We have

$$\begin{aligned}\int_1^9 \frac{3x-2}{\sqrt{x}} dx &= \int_1^9 \frac{3x}{\sqrt{x}} - \frac{2}{\sqrt{x}} dx \\ &= \int_1^9 (3x^{1/2} - 2x^{-1/2}) dx \\ &= 2x^{3/2} - 4x^{1/2} \Big|_1^9 \\ &= (2 \cdot 9^{3/2} - 4 \cdot 9^{1/2}) - (2 \cdot 1^{3/2} - 4 \cdot 1^{1/2}) \\ &= 2 \cdot 27 - 4 \cdot 3 - 2 + 4 = \boxed{44}\end{aligned}$$

§5.3 #22. Evaluate the integral $\int_{\pi/4}^{\pi/3} \sec \theta \tan \theta d\theta$.

We have

$$\begin{aligned}\int_{\pi/4}^{\pi/3} \sec \theta \tan \theta d\theta &= \sec \theta \Big|_{\pi/4}^{\pi/3} \\ &= \sec \left(\frac{\pi}{3} \right) - \sec \left(\frac{\pi}{4} \right) \\ &= \boxed{2 - \sqrt{2}}\end{aligned}$$