Homework 3

Math 252

Due April 21st at 11:59 PM

Textbook Exercises

1.4: 207, 211, 221, 241 (for 221, remember that the surface area of a sphere is $4\pi r^2$.)

1.5: 257, 261, 267, 271, 275, 277, 281, 293, 297

1.6: 321, 327, 329, 335, 337, 341, 355, 357

Exercise 1: A car accelerates from a stand-still at $5\frac{m}{s^2}$ for 3 seconds, before shifting gears and accelerating at $2\frac{m}{s^2}$ for another 10 seconds. At this point, it's going well over the speed limit, so it **de**celerates at $1\frac{m}{s^2}$ for 5 seconds before ceasing to accelerate at all (for eternity). If t is the number of seconds after the car starts accelerating, let $a(t)$ be the car's acceleration, $v(t)$ its velocity, and $s(t)$ its net displacement.

a) Sketch a graph of $a(t)$ on $[0, \infty)$.

b) Find $v(t)$ and sketch a graph of it on $[0, \infty)$.

c) Find $s(t)$ and sketch a graph of it on $[0, \infty)$.

d) How far has the car traveled after 20 seconds?

e) Look up the conversion between meters per second and miles per hour. If the speed limit is 70 mph, is the car above or below the limit after it stops decelerating?

Exercise 2: Compute $\int \frac{3}{y} \sin(\ln(y^2))\ dy$.

Bonus: Let c and d be real numbers with $c \neq 0$. Let f be a function integrable on $[a, b]$. Show that the average value of f on $[a, b]$ is the same as the average value of $f\left(\frac{1}{c}(x - d)\right)$ on $[ca + d, cb + d]$.