Here are some practice problems that are about the right level for the test. I’ll discuss any that are causing difficulties on Wednesday. I have decided that the test will only go through 8.2, not 8.4 as previously announced. I decided this after making up these problems, some of which do not apply now.

Q1. Find the integrals of the following functions:

\[ x^2 \ln x, \ x \cos x, \ x \tan^{-1} x, \]
\[ \cos^5 x, \ \sin x \cos 2x, \ \tan^4 x, \]
\[ x^2 \sqrt{1-x^2}, \ \frac{1}{\sqrt{1+x^2}}, \]
\[ \frac{1}{(x-1)(x-2)}, \ \frac{x}{(x+1)(x^2+1)}, \]
\[ \frac{x^2}{(1+x^3)^4}, \ e^x \sin(e^x). \]

Q2. Find the upper and lower Riemann sums for

\[ \int_0^1 x \, dx. \]

Q3. Find the derivative of

\[ \int_0^{x^2} \sin(t^4) \, dt. \]

Q4. Using differentiation show that

\[ \ln(x^2) = 2 \ln x, \ x > 0. \]

Q5. Find the area between \( y = x \) and \( y = x^3 \).

Q6. Find the volume generated when \( y = x^2 \) from \( x = 0 \) to \( x = 1 \) is rotated about the line \( y = -1 \).

Q7. The area between \( y = \sin x \) and the \( x \)-axis from \( x = 0 \) to \( x = \pi \) is rotated about the \( y \)-axis. Find the volume.

Q8. A solid has bases the disc \( x^2 + y^2 \leq 1 \) and the cross-sections are squares. Find the volume.

Q9. A bowl in the shape of a hemisphere of radius 2 feet is full of water. Find the work done in pumping out all the water.