The following problems should help you review for the final exam. Don't hesitate to ask for hints if you get stuck.

Integration Techniques

1.   Evaluate the following integrals.
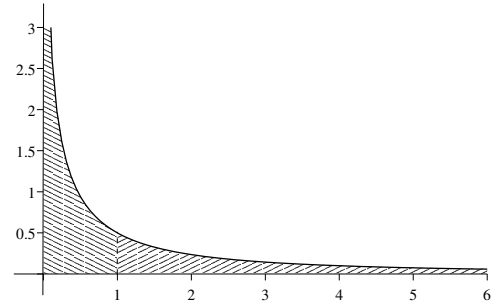
(a) $\displaystyle\int_0^{\pi/2} \cos^5(x)\,dx$

(b) $\displaystyle\int \frac{\sqrt{4-9x^2}}{x}\,dx$

(c) $\displaystyle\int_1^e x^3 \ln(x)\,dx$

(d) $\displaystyle\int \frac{\sqrt{x+3}}{x+2}\,dx$

Improper Integrals

2. Compute the integral $\int_0^\infty \dfrac{1}{\sqrt{x}\,(1+x)}\,dx$. (Hint: write it as the sum of two integrals.)

Volumes

3. The region to the right of the y-axis, above the x-axis, and below the curve $y = 4 - x^2$ is revolved about the y-axis. Set up an integral that represents the volume of the resulting solid
(a) by the method of slices (discs)
(b) by the method of cylindrical shells.
Then find the volume, by either method you like.
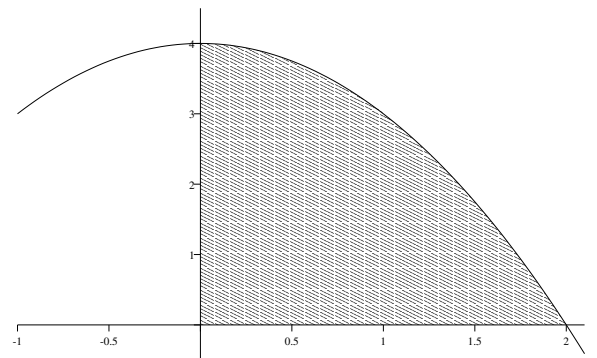
Work

4.   A cable hanging from the top of a building is 15m long and has a mass of 40kg. A 10kg object is attached to the end of the rope. How much work is required to pull 5m of the cable up to the top?
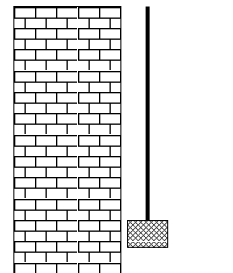
Area Between Curves

5.   Find the area of the region bounded by $y = x^2 + 2x$ and $y = x + 3.75$ between $x = 0$ and $x = 2$.