# W01 Regular

**Due date: Sunday 1/18, 11:59pm**

**01 ★**

**Shells volume - set up integrals, both axes**

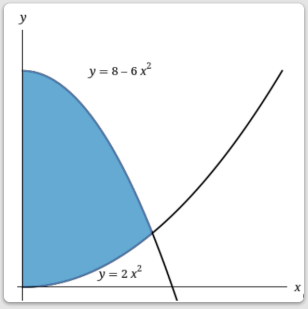
Consider the region in the first quadrant bounded by the lines $x = 0$ and $y = 2$, and the curve $y = 4 - x^2$.

Set up integrals to find the volumes of the solids obtained by revolving this region about (i) the $x$-axis, and (ii) the $y$-axis. (No need to evaluate these integrals.)

**02 ★**

**Shells volume - shells v. washers**

Consider the region in the $xy$-plane, in the first quadrant, bounded by the $y$-axis on the left, by $y = 8 - 6x^2$ on the top, and $y = 2x^2$ on the bottom.




A 3D solid is given by revolving this region around the $y$-axis.

(a) Find the volume of the solid using the method of shells.

(b) *Attempt* to find the volume of the solid using the method of washers/disks. Why is this harder? (TWO reasons!)

**03 ★**

**Integration by parts - A and L**

Compute the integral:

$$\int x^3 \ln x \, dx$$

**04**

**Integration by parts - A and E**

Compute the integral:

$$\int_0^3 xe^{4x}\,dx$$

**05 ★**

**Integration by parts - A and I**

Compute the integral:

$$\int \tan^{-1}(x)\,dx$$

06

**Integration by parts - E and T, “breaking the circle”**

Compute the integral:

$$\int e^x \sin(x)\, dx$$

You should perform IBP twice, find an equation, and use algebra to solve it (“breaking the circle”) for the desired integral.