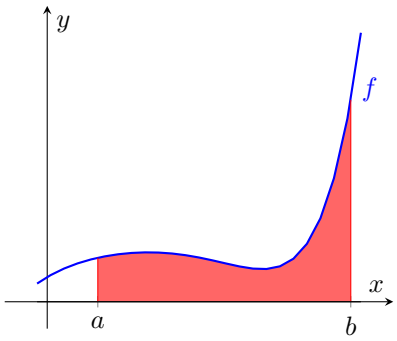
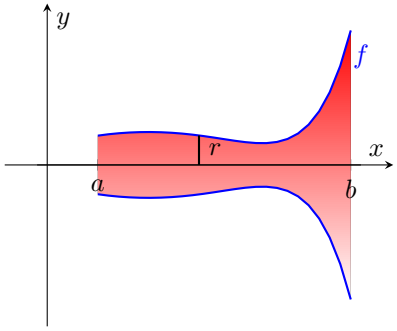
Instructions. Show all work, with clear logical steps. No work or hard-to-follow work will lose points.

Problem 1. (3 points) Set up an integral that represents the volume of the solid obtained by rotating the following region about the x-axis.



Solution. Since we're rotating f about the x-axis, we want 'dx.'



Using our trusty formula,

$$\pi \int_a^b [f(x)]^2 \, dx$$

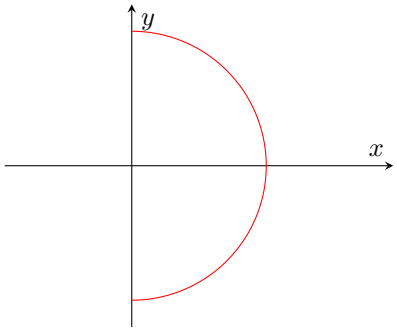
□

Problem 2. (5 points) Find the volume of the solid obtained by revolving the region bounded by

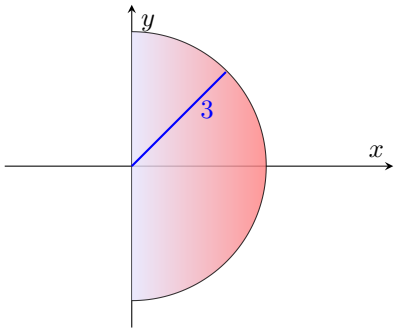
$$x = \sqrt{9 - y^2}, \qquad x = 0$$

about the x-axis.

Solution. First we draw a picture.



We're rotating about the x-axis, so that yields a hemisphere of radius 3.



From before calculus, we know that the answer should be $\frac{2}{3}\pi \cdot 3^3$. Since we are rotating about the x-axis, our the space between our radii is dx. So we need to solve for y in the given equation for the semicircle.

$$\begin{aligned} x &= \sqrt{9 - y^2} \\ x^2 &= 9 - y^2 \\ y^2 &= 9 - x^2 \\ y &= \pm\sqrt{9 - x^2}. \end{aligned}$$

Since we are rotating about the x-axis, we only need to take one of these, so we might as well take the positive one. Now,

$$\begin{aligned} \text{Volume} &= \pi \int_0^3 \left(9 - x^2\right)\, dx \\ &= \pi \left[9x - \frac{1}{3}x^3\right]_0^3 \\ &= \pi \left(9 \cdot 3 - \frac{1}{3} \cdot 3^3\right) \\ &= \pi \cdot \left(\frac{2}{3} \cdot 3^3\right) \\ &= 18\pi. \end{aligned}$$

□

Problem 3. (2 points) What model of calculator do you use for your homework; is it course-approved? If not, what course-approved calculator will you bring to the exam on Monday?

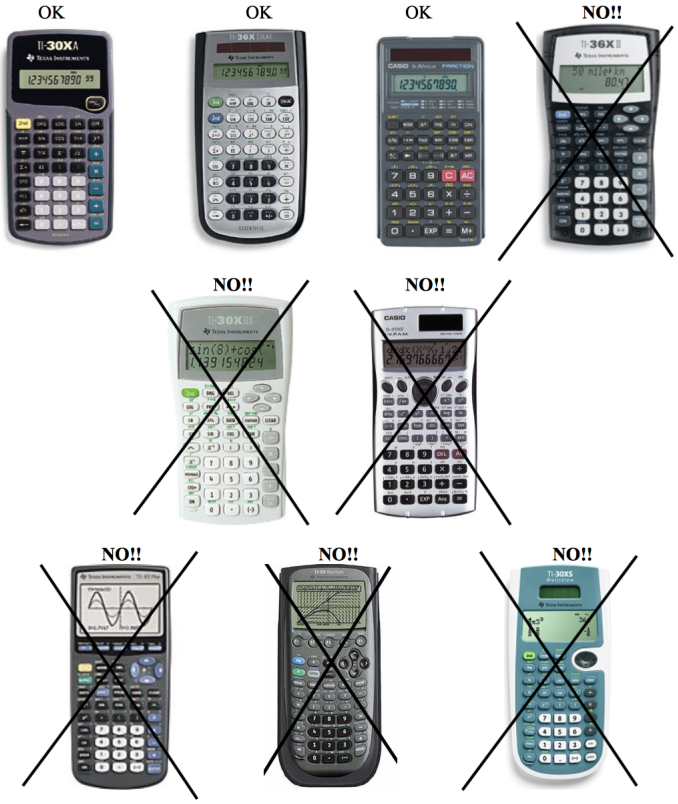
Solution. The course-approved calculators are posted on the course webpage (`http://math.purdue.edu/ma16020`).

MA 16020 -- CALCULATOR POLICY

A ONE-LINE scientific calculator is REQUIRED. No other calculator is allowed. RECOMMENDED: TI-30Xa calculator.

****LOOK AT ALL THE PICTURES BELOW CAREFULLY!!!**

A **one-line** display shows what you type in and the answer on the same line. A simple check is to type in "2 + 2" and then hit "=". The only thing you should see is the number 4.



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