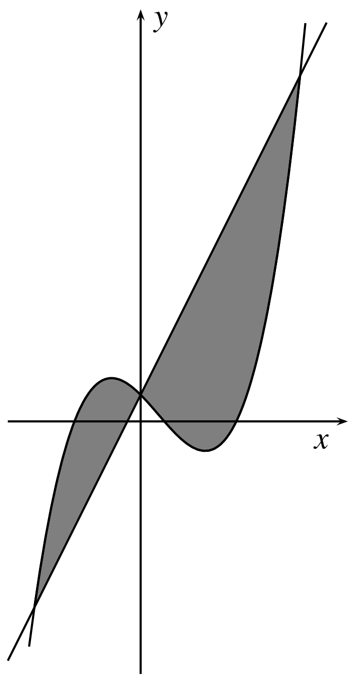
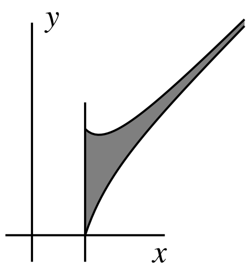
5. (8 points) Find the area of the shaded region between the curves $y = x^3 - x^2 - 2x + 1$ and $y = 4x + 1$, as shown below.



6. (8 points) Consider the *unbounded* region S contained within the curves

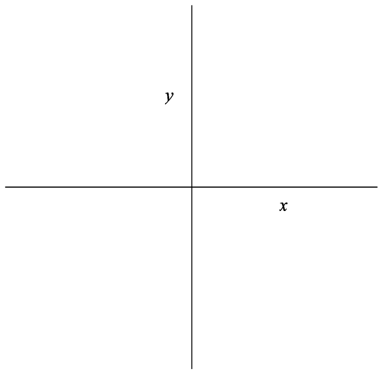
$$y = x + \frac{1}{x^2}, \qquad y = x - \frac{1}{x^2} \qquad \text{and} \qquad x = 1$$

as shown in the picture below.



Is the area of S finite or infinite? If it is finite, justify your conclusion and find this area. If it is infinite, carefully explain why.

4. (8 points) Consider the region bounded by the line $y = \frac{3}{2}x$, the parabola $y = x^2 - 1$, and lying above the x-axis. Sketch this region and find its area.



6. (7 points) Let R be the region enclosed by the curves

$$y = |x|, \quad y = x^2 - 2.$$

Sketch R and find its area.

4. (8 total points) Determine if the following are **TRUE** or **FALSE**. You need not explain your answers. Each correct answer is $+2$ points, each wrong answer is -1 points, each blank answer is 0 points, but your total for this whole problem will not be less than 0 points. Put your **ANSWERS** in the **BOXES**.

   (a) (2 points) The function $f(x) = \dfrac{e^x}{x}$ is a solution of the differential equation $x^2y' + xy = xe^x$.

   Answer (T or F or leave blank):

   (b) (2 points) $\dfrac{d}{dx}\displaystyle\int_2^{x^2+1} \ln(t)dt = \ln(x^2+1)$.

   Answer (T or F or leave blank):

   (c) (2 points) The arc length of the curve $y = \tan x$ for $0 \le x \le \dfrac{\pi}{4}$ is $\displaystyle\int_0^{\pi/4} \sqrt{1+\sec^2 x}\, dx$.

   Answer (T or F or leave blank):

   (d) (2 points) If f and f' are continuous on $[3,7]$, then $\displaystyle\int_3^7 f'(u)du = f(7) - f(3)$.

   Answer (T or F or leave blank):