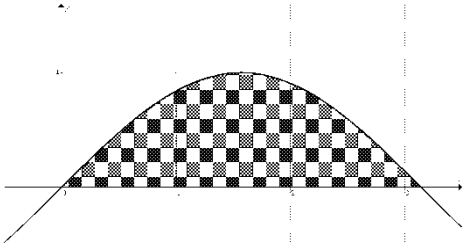
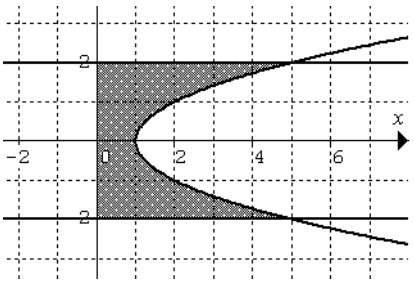
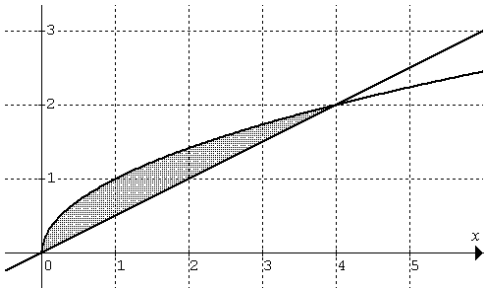
Volume



[1] The region shown in the graph is bounded by one arch of the sine curve.
[a] Set up and evaluate by hand a definite integral for the volume generated by rotating the region about the *x*-axis.
[b] Set up a definite integral for the volume generated by rotating the region about the line $y=-1$. Evaluate with a calculator.
[c] Set up a definite integral for the volume generated by rotating the region about the line $y=1$. Evaluate with a calculator.
[d] A certain solid has the shaded region as its base. The cross sections of the solid cut perpendicular to the *x*-axis are squares. Set up and evaluate by hand a definite integral for the volume of this solid.

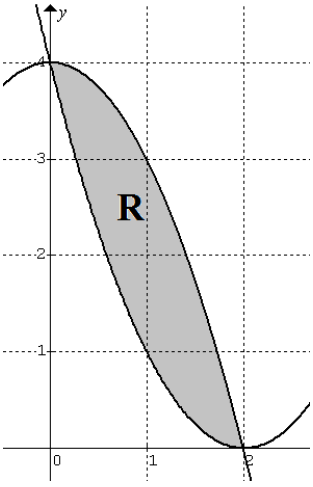


[2] The shaded region on the graph is bounded by $x=y^2+1$, $x=0$, $y=2$, and $y=-2$.
[a] Set up and evaluate by hand a definite integral for the volume generated by rotating the region about *y*-axis.
[b] Set up a definite integral for the volume generated by rotating the region about the line $x=-1$. Evaluate with a calculator.
[c] Set up a definite integral for the volume generated by rotating the region about the line $x=5$. Evaluate with a calculator.
[d] A certain solid has the shaded region as its base. The cross sections of the solid cut perpendicular to the *y*-axis are semicircles. Set a definite integral for the volume of this solid.



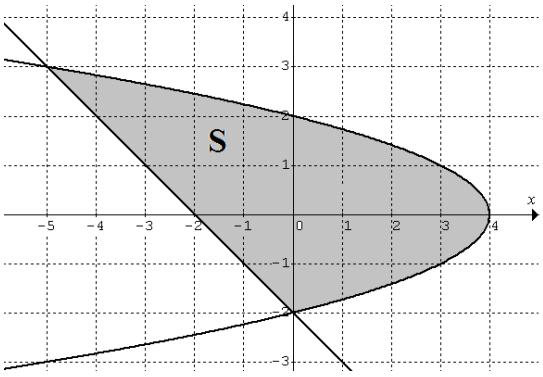
[3] The shaded region on the graph is bounded by $y=\sqrt{x}$ and $y=\frac{x}{2}$.
[a] Set up and evaluate by hand a definite integral for the volume generated by rotating the region about the *x*-axis.
[b] Set up a definite integral for the volume generated by rotating the region about the line $y=-3$. Evaluate with a calculator.
[c] Set up a definite integral for the volume generated by rotating the region about the line $y=2$. Evaluate with a calculator.
[d] A certain solid has the shaded region as its base. The cross sections of the solid cut perpendicular to the *x*-axis are equilateral triangles. Set up and evaluate by hand a definite integral for the volume of this solid.

[4 -- 7] **<u>Set up an expression involving one or more definite integrals for each of the following</u>**

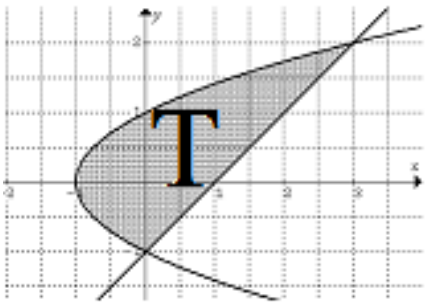


[4] The region **R** shown in the diagram is bounded by the graphs of $y=4-x^2$ and $y=(x-2)^2$.
[a] The perimeter of **R**.
[b] The area of **R**
[c] The volume of the solid of revolution about the line $y=0$.
[d] The volume of the solid of revolution about the line $y=-3$.
[e] The volume of the solid of revolution about the line $y=5$.
[f] The volume of the solid of revolution about the line $x=0$.
[g] The volume of the solid of revolution about the line $x=3$.
[h] The volume of the solid of revolution about the line $x=-1$.

[i] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are squares.
[j] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are semicircles.
[k] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are equilateral triangles
[l] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are isosceles right triangles (hypotenuse on the base of the solid).
[m] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are isosceles right triangles (leg on the base of the solid).
[n] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are rectangles with height 2
[o] The volume of the solid with base **R** whose cross-sections perpendicular to the *x*-axis are rectangles with height given by $h(x) = 2x + 3$
[p] The volume of the solid with base **R** whose cross-sections perpendicular to the *y*-axis are rectangles with height equal to three times the *y* value.
[q] The volume of the solid with base **R** whose cross-sections perpendicular to the *y*-axis are squares.
[r] The volume of the solid with base **R** whose cross-sections perpendicular to the *y*-axis are semicircles



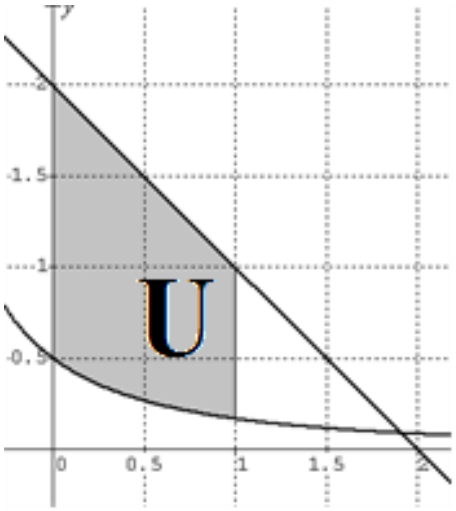
[5] The region **S** shown in the diagram is bounded by the graphs of $x = 4 - y^2$ and $x = -y - 2$.
[a] The perimeter of **S**.
[b] The area of **S**
[c] The volume of the solid of revolution about the line $x = -5$.
[d] The volume of the solid of revolution about the line $x = 4$.
[e] The volume of the solid of revolution about the line $x = -10$.
[f] The volume of the solid with base **S** whose cross-sections perpendicular to the *y*-axis are squares.
[g] The volume of the solid with base **S** whose cross-sections perpendicular to the *y*-axis are semicircles.
[h] The volume of the solid with base **S** whose cross-sections perpendicular to the *y*-axis are equilateral triangles
[i] The volume of the solid with base **S** whose cross-sections perpendicular to the *y*-axis are rectangles with height given by $h(y) = y + 3$.
[j] The volume of the solid with base **S** whose cross-sections perpendicular to the *y*-axis are rectangles with height equal to twice the length of the base.



[6] The region **T** shown in the diagram is bounded by the graphs of $x = y^2 - 1$ and $x = y + 1$.
[a] The perimeter of **T**.
[b] The area of **T**
[c] The volume f the solid of revolution about the line $x = 3$.
[d] The volume of the solid of revolution about the line $x = -1$.
[e] The volume of the solid of revolution about the line $x = 6$.
[f] The volume of the solid with base **T** whose cross-sections perpendicular to the *y*-axis are squares.
[g] The volume of the solid with base **T** whose cross-sections perpendicular to the *y*-axis are semicircles.
[h] The volume of the solid with base **T** whose cross-sections perpendicular to the *y*-axis are isosceles right triangles with the hypotenuse on the base.

[i] The volume of the solid with base **T** whose cross-sections perpendicular to the *y*-axis are rectangles with height given by $h(y) = 2y + 1$.

[j] The volume of the solid with base **T** whose cross-sections perpendicular to the *y*-axis are rectangles with height equal to three times the length of the base.



[7] The region **U** shown in the diagram is bounded by the graphs of $y = 2 - x$, $y = \dfrac{1}{x^2 + 3x + 2}$, $x = 1$, and the *y*-axis.

[a] The perimeter of **U**.

[b] The area of **U**

[c] The volume of the solid of revolution about the line $y = 0$.

[d] The volume of the solid of revolution about the line $y = -2$.

[e] The volume of the solid of revolution about the line $y = 2$.

[f] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are squares.

[g] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are semicircles.

[h] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are equilateral triangles

[i] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are isosceles right triangles (hypotenuse on the base of the solid).

[j] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are isosceles right triangles (leg on the base of the solid).

[k] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are rectangles with height 4

[l] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are rectangles with height given by $h(x) = x^2$

[m] The volume of the solid with base **U** whose cross-sections perpendicular to the *x*-axis are rectangles with height equal to half the length of the base.