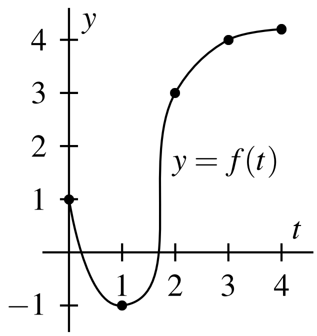
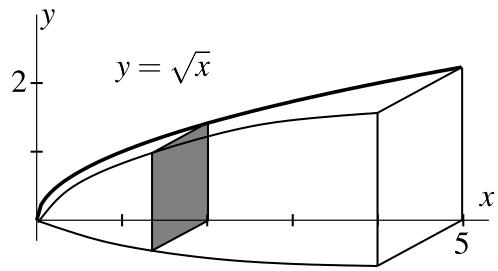
4. (8 points) Suppose that the graph of f is as shown:

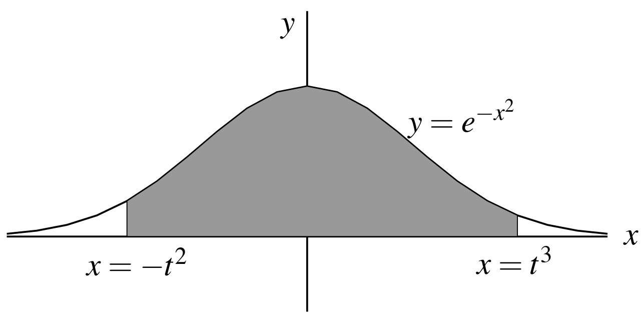


Let $G(x) = \int_x^{x^2+x} t f(t)\,dt$. Find $G'(1)$.

5. (4 points) Find the volume of the solid shown below. Each cross-section (slice) is a square.



6. (8 points) At each time $t \geq 0$, $\mathscr{R}_t$ is the region above the x-axis, below the curve $y = e^{-x^2}$, with left side on the line $x = -t^2$ and right side on the line $x = t^3$ (see the figure). Let $A(t)$ be the area of $\mathscr{R}_t$. Find $\dfrac{dA}{dt}$ at time $t = 1$.



3. (6 points) Let

$$E(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2}\,dt,$$

and let

$$G(x) = E(\sqrt{x}).$$

Compute $G'(x)$.

5. (8 points) Find

$$\lim_{x\to 0} \frac{\int_0^x \cos(t^2)\,dt}{x}.$$

6. (12 total points) The region between the curve $y = e^{x^3}$ and the lines $y = 0$, $x = 1$, and $x = t$ is rotated about the vertical line $x = 1$. Here $t > 1$ is not further specified.

   (a) (8 points) Write down an integral for the volume of the resulting solid. **Do not evaluate this integral.**

   (b) (4 points) The volume from part (a) is a function of t; call it $V(t)$. Find the derivative $V'(2)$.