1. (7 pts) Find the function $F(x)$ such that $F'(x) = x\sqrt{3x+1}$ and $F(0) = 0$.

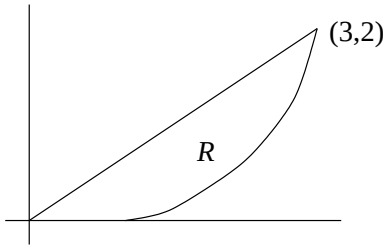
2. (8 pts) Use the Midpoint Rule (taking y-values at the midpoints of the intervals) with $n = 3$ subdivisions to find the approximate value of $\int_0^6 \frac{x^2+5}{x^3+1}\,dx$. Give your answer to two decimal places (to the nearest .01).

3. (5 pts) Let $f(x) = \displaystyle\int_0^{\sqrt{2x+7}} \frac{dt}{t^4+9}$. Compute $f'(x)$.

4. (8 pts) Compute $\displaystyle\int_{\pi/6}^{\pi/3} \frac{\sin 3x}{2+\cos 3x}\, dx$.

5. Let R be the region above the x-axis, above the curve $y = \frac{1}{4}(x^2 - 1)$, and below the line $y = \frac{2}{3}x$. (See the drawing.)

(a) (3 pts) Express the area of R as an integral, or sum of integrals, of the form $\int_a^b f(x)\,dx$. Do not evaluate the integral(s).

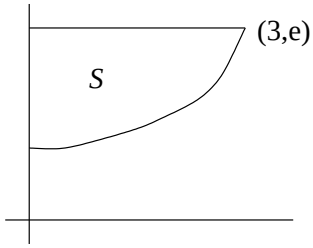


(b) (3 pts) Express the area of R as an integral, or sum of integrals, of the form $\int_a^b f(y)\,dy$. Do not evaluate the integral(s).

(c) (4 pts) Evaluate the integral(s) in either (a) or (b) [take your pick] to find the area of R.

6. Let S be the region bounded by the curve $y = e^{x/3}$, the line $y = e$, and the y-axis. (See the drawing.)

   (a) (8 pts) Find the volume of the solid obtained by revolving S about the x-axis.



   (b) (4 pts) Set up an integral that represents the volume of the solid obtained by revolving S about the y-axis. *Do not evaluate the integral.*