Your Name (please PRINT clearly)

Student ID #

PLEASE READ these instructions:

- Once the exam starts, check that you have a complete exam: 5 problems on 5 pages of questions.
- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ page of handwritten notes, two-sided. Do not share notes.
- Only a TI-30X IIS calculator is allowed. You may not use headphones or any other electronic devices. Please turn OFF your cell phone and put it away.
- Remember to **SHOW YOUR WORK**. If your work is incorrect, incomplete, or unreadable, you may receive little credit, even if the answer itself happens to be correct.
- Simplify your answers, but leave them in exact form (e.g. $\pi\sqrt{2}+\frac{1}{2}$), unless otherwise instructed. Place a box around $\boxed{\text{your final answer}}$ to each question.
- Please stay within the page borders. Exams will be scanned and the far edges may not be readable.
- **All pages are double-sided, except for this cover page and the last page.**

  You may use the two blank sides for extra room if needed but if you want us to grade these spare pages clearly **indicate in the problem area** that your work is on the back of the last page or on back of the cover page.
- Read each question carefully, before and after answering it. Raise your hand if you have a question. Good luck!

Problem	Points
1	10
2	10
3	10
4	10
5	10
Total	50

[use this blank page for extra space, if needed – but indicate in the problem area that you did so]

1. (10 points) Evaluate the following integrals. Show your steps. Simplify and box your final answer.

   (a) $\displaystyle\int \left(\sin(x)\cos(x) + \frac{3\sin(x)}{\cos^2(x)} - 2 \right) dx$

   (b) $\displaystyle\int_3^4 \frac{x^2}{(x-2)^2}\, dx$

2. A particle is moving in a straight line with an acceleration at t seconds of:

$$a(t) = 6t \text{ ft/s}^2.$$

At $t = 3$ seconds, the particle's velocity of the particle is measured to be $v(3) = 15$ ft/s.

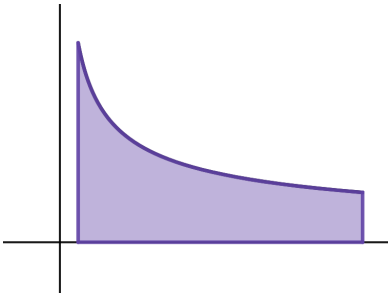
(a) (4 points) Find the particle's velocity function, $v(t)$.

(b) (6 points) Find the **total distance** traveled by the particle in the first 3 seconds.

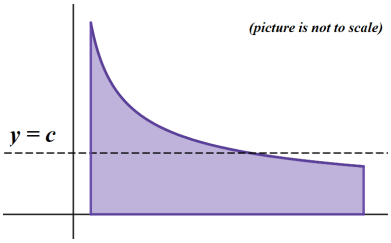
3. (10 points) Consider the region bounded by:

$$y = \frac{1}{\sqrt{x}}, \text{ the } x\text{-axis, and the lines } x = 1 \text{ and } x = 16$$

(a) Compute the area A of this region. Show your work.



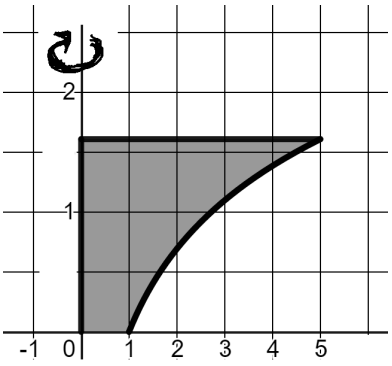
(b) Suppose the portion of the region that lies **above** the **horizontal line** $y = c$ is **one third of the total area** A of the region. Compute the value of c.



4. (10 points) Let $\mathcal{R}$ denote the region bounded by the graphs of:

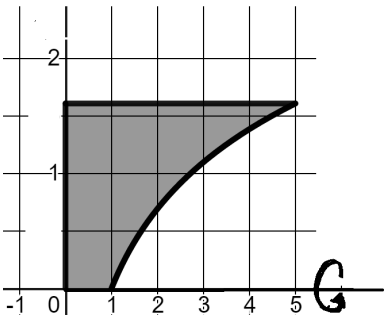
$$y = \ln(x),\ y = \ln(5),\ \text{the } x\text{-axis, and the } y\text{-axis}$$

(a) Compute the volume of the solid of revolution obtained by rotating this region $\mathcal{A}$ **about the y-axis**.

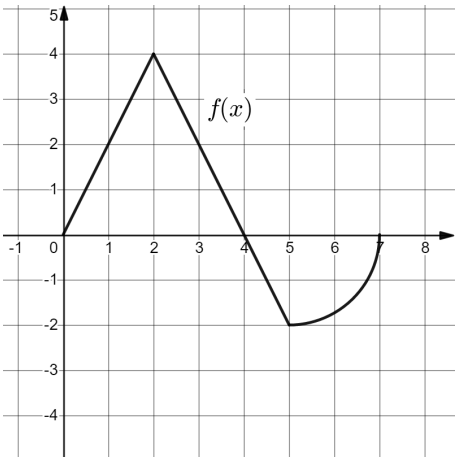


(b) Express the volume of the solid of revolution obtained by rotating this region $\mathcal{R}$ **around the x-axis** as an integral or as a sum/difference of integrals.

Do not evaluate the integral(s), just write down the expression.



5. (10 points) The figure on the right shows a function $y = f(x)$ whose graph consists of two line segments and a quarter of a circle. Use this graph to find each of the following quantities.



Leave your answers in exact form. SHOW WORK.

(a) $\int_0^7 f(x)\,dx =$

(b) Define a function $F(x) = \int_0^x f(t)\,dt$.
What is the maximal value of $F(x)$ in the interval $[0,7]$, and at what value of x is it reached?

(c) Define a function $G(x) = \int_{x^2}^0 f(t)\,dt$. Compute $G'(1)$.

(d) Compute $\lim_{n\to\infty} \sum_{i=1}^{n} [1 + f(2i/n)] \cdot (2/n) =$

[use this blank page for extra space, if needed – but indicate in the problem area that you did so]