

Your Name

Your Signature

Student number

- Turn off all cell phones, pagers, radios, mp3 players, and other similar devices.
- This exam is closed books. You may use one $8\frac{1}{2}'' \times 11''$ sheet of handwritten notes (you can write on both sides).
- You can use only Texas Instruments TI-30X calculator.
- Give your answers in exact form, not decimals, unless instructed otherwise.
- In order to receive credit, you must **show all of your work**. If you do not indicate the way in which you solved a problem, you may get little or no credit for it, even if your answer is correct.
- **Check your work carefully.** We will award only limited partial credit.
- Place to each question.
- If you need more room, use the backs of the pages and indicate that you have done so.
- Raise your hand if you have a question.
- This exam has 6 pages, plus this cover sheet. Make sure that your exam is complete.

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1. (10 points) Estimate the net area between the graph of the function $f(x) = 1/(\ln x)$ and the x -axis, between $x = 2$ and $x = 4$. Use the midpoint rule with 3 subintervals. Give your answer as a decimal number with 5 significant digits.

2. Compute the integrals.

(a) (4 points)

$$\int \tan^5 x \sec^2 x \, dx$$

(b) (6 points)

$$\int x [\tan(5x^2 + 8) \sec(5x^2 + 8)]^2 \, dx$$

3. (10 points) A group of scientists studying climate change proposed the following model for the global temperatures. Starting January 1, 2023, the temperature will rise at the rate of $0.05 + 0.01t$ degrees per year, for 5 years. For 5 years starting January 1, 2028, the temperature will change at the rate of $0.1 - 0.01(t - 5)^2$ degrees per year. In both formulas, $t = 0$ represents January 1, 2023. Find the global temperature increase between January 1, 2023 and January 1, 2033, according to the model.

Give your answer as a decimal number with 5 significant digits.

4. (10 points) Find $f'(-2)$ if

$$f(x) = \int_{x+1}^{x^2+x} t e^{2t+1} dt.$$

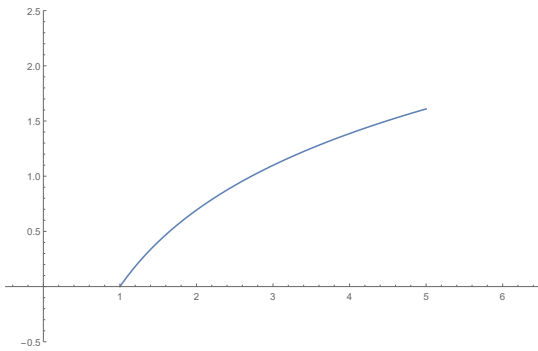
Give the answer in exact simplified form.

5. (10 points) In a physics experiment, an object moving along a straight line was given the acceleration $a(t) = t^{-2} + 1$ between times $t = 1/4$ and $t = 10$. The object was moving with the initial speed $v(1/4) = -3.75$ at time $t = 1/4$.

Give answers in the exact form or in the decimal form with at least 5 significant digits.

- (a) (4 points) Find the displacement of the object between the times $t = 1/2$ and $t = 2$.
- (b) (6 points) Find the total distance traveled over the time interval $(1/3, 5)$.

6. A region A lies above the x -axis, below the graph of $y = \ln x$, between $x = 1$ and $x = 5$ (see the figure below).



- Find the volume of the solid of revolution obtained by rotating the region A about the line $x = 6$.
Give the answer in the exact form or in the decimal form with at least 5 significant digits.