EXAM 1 TMath 125 Spring 2026

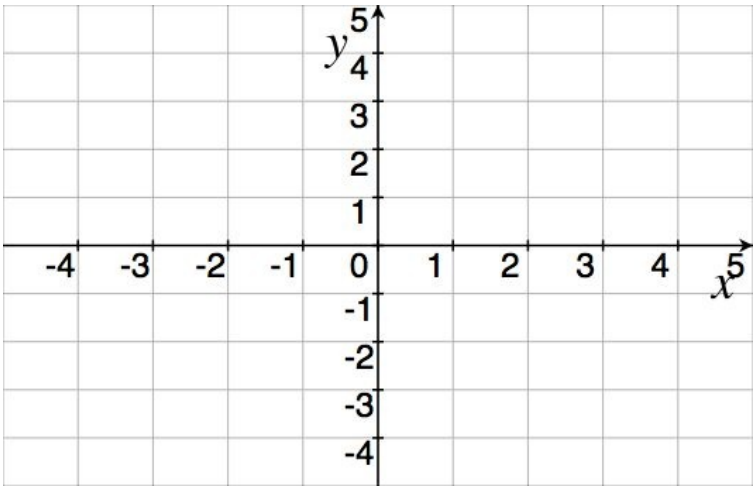
Show *all* your work. Reasonable supporting work must be shown for any partial credit.

1. [4] (Quiz0 #4) Sketch the graph of a function α that satisfies *all* of the following.

   (a) $\alpha(-2) = 4$

   (b) $\alpha'(3) = -1$

   (c) $\displaystyle\int_0^3 \alpha(x)\,dx = 5$

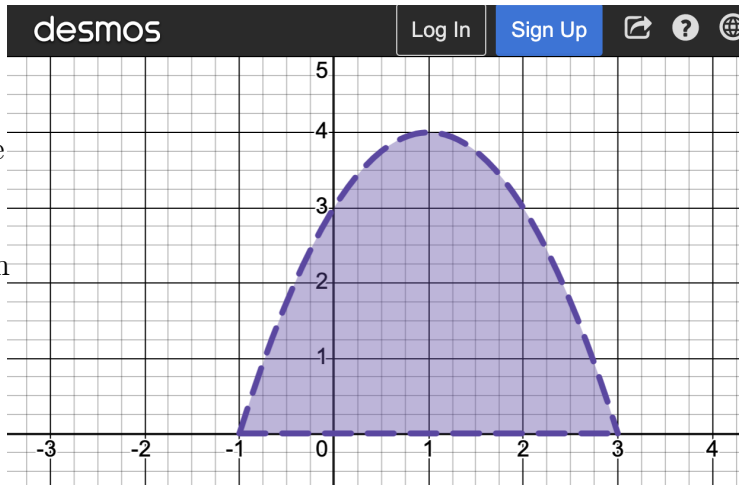


2. [2] (SummationActivity #1) Expand $\displaystyle\sum_{i=0}^{3} \frac{(-1)^i \cdot i}{2}$

3. [8] (WebHW5.5 #1 & PracticeExam#5) Find:

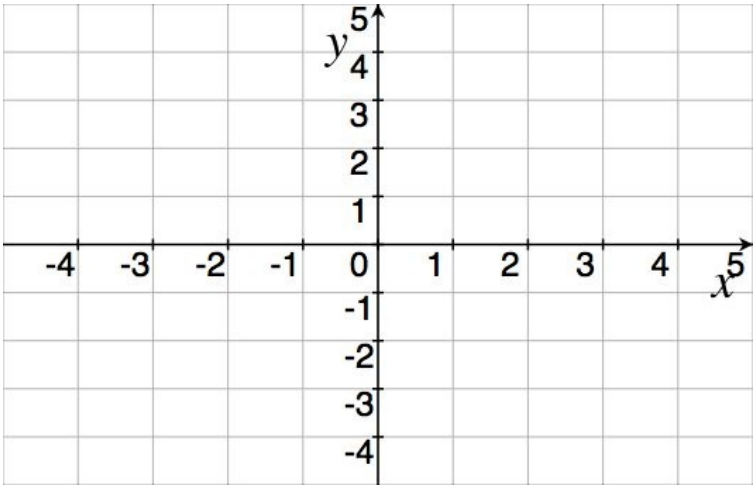
   $\displaystyle\int 3xe^{-x^2}\,dx$ $\qquad\qquad$ $\displaystyle\frac{d}{dx}\left(\int_0^{3x+5} \frac{t}{1+t^3}\,dt\right)$

4. [3] (DefiniteActivity #2)
Describe the shaded area trapped below the parabola and above the x axis as a definite integral. Make sure you write it in such a way that technology could finish the problem for you.



5. Let $f(x)$ be defined below.

$$f(t) = \begin{cases} 2\sin\left(\frac{\pi}{2}t\right) & \text{if } t < 2 \\ 2t - 4; & \text{if } 2 < t \end{cases}$$



(a) [3] (PracticeExam1 #3)
Graph f on the axis.

(b) [3] (§5.2 #60)
Find $\int_{-2}^{4} f(t)\,dt$.

(c) [2] (WebHW5.4&5.3 #12) Let $g(x) = \int_{2}^{x} f(t)\,dt$, find $g(4)$.

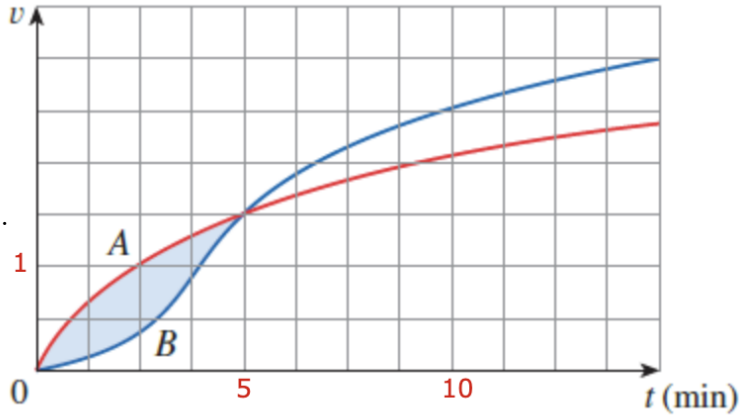
(d) [2] (Quiz2 #4) Find $g'(4)$.

6. [4] (Exam1 '23#7 & Quiz2) #1) Each of the following is wrong. Find the step with the error and explain why it was wrong.

(a) $$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin(x)}{\cos^2(x)}\,dx = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{-1}{u^2}\,du = u^{-1}\Big]_{\frac{\pi}{6}}^{\frac{\pi}{3}} = \left(\frac{\pi}{3}\right)^{-1} - \left(\frac{\pi}{6}\right)^{-1} = \frac{3}{\pi} - \frac{6}{\pi} = \frac{-3}{\pi}$$

(b) $$\int_1^8 \frac{3}{\sqrt[3]{x}}\,dx = \int_1^8 3x^{\frac{-1}{3}}\,dx = 3\left(\frac{-1}{3}\right) x^{\frac{-4}{3}}\Big|_1^8 = -1 \cdot 8^{\frac{-4}{3}} - (-1 \cdot (1)^{\frac{-4}{3}}) = -9.375$$

7. (WebHW6-1#9) Two cars A and B start side by side and accelerate from rest. The figure shows the graphs of their velocity functions (km per min).



(a) [2] Which car is going faster at $t = 4$? Explain how you know.

(b) [2] Which car is in the lead when $t = 4$? Explain how you know.

(c) [2] Which car is accelerating more when $t = 4$? Explain how you know.

(d) [3] What is the meaning of the shaded region in the context of this problem?

(e) [2] Consider the distance between the cars at 5 minutes. Is it greater than 6km or less? Provide reasoning.

8. [3] (WebHW5.1 #4) Oil leaked from a tank at a rate of $r(t)$ liters per hour. The rate decreased as time passed and values of the rate at variable time intervals are shown in the table. Estimate a worst case scenario by overestimating total oil leaked over the 10 hours.

t (hours)	0	2	3	6	7	10
$r(t)$ (Liters/hour)	8.7	7.6	6.8	6.2	5.7	5.3

9. (WordProblem1 #13) Consider the parabola $y = x^2 - 5x + 2$ & the line graphed below.

   (a) [1] Shade the area trapped by the parabola and the line.

   (b) [4] Set up the definite integral (but do *not* compute!) that will find the area of the region trapped by the line and the parabola.
   Make sure you write it in such a way that technology could finish the problem for you.