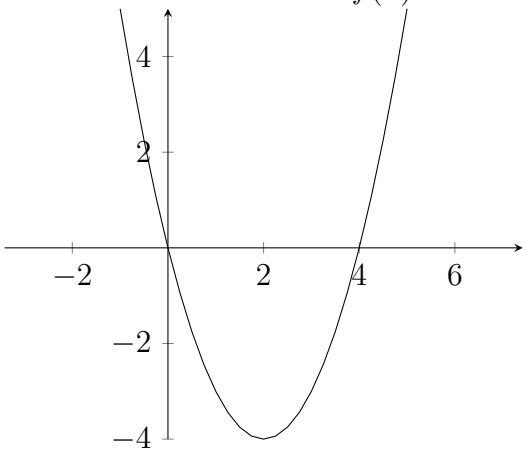
1. Which of the following is an antiderivative of x^2e^x?

   A. $(x^2 - 2x + 2)e^x$
   B. $(x^2 + 2x)e^x$
   C. $(x^2 + 2x)e^x + C$
   D. x^2e^x
   E. $2xe^x + C$

2. A graph of $f'(x)$, **the derivative** of $f(x)$, is given below. What is the x-coordinate of a relative minimum of $f(x)$?



   A. 0 B. 1 C. 2 D. 3 E. 4

3. Evaluate $\displaystyle\int_1^{e^2} \frac{(\ln x)^2}{x}\,dx$

   A. $(e^6 - 1)/3$
   B. 8
   C. $4/e^2$
   D. 4
   E. 8/3

4. If $f(x) = \tan^{-1}(x) - \ln(x^2 + 1)$ then $f'(x) =$

   A. 0
   B. $\dfrac{1 - 2x}{1 + x^2}$
   C. $\dfrac{2x + 1}{x^2 + 1}$
   D. $\dfrac{2x}{\sqrt{x^2 + 1}}$
   E. $\dfrac{1}{\sqrt{x^2 + 1}}$

5. Water is leaking out of an inverted conical tank at a rate of 100,000 cm^3/min at the same time that water is being pumped into the tank at a constant rate. The tank has height 600 cm and the diameter at the top is 400 cm. If the water level is rising at a rate of 10 cm/min when the height of the water is 300 cm, find the rate at which water is being pumped into the tank, rounded to the nearest 1000 cm^3/min.

   NOTE: the volume of a cone with radius r and height h is $\frac{1}{3}\pi r^2 h$.

   A. 114,000 cm^3/min.
   B. 214,000 cm^3/min.
   C. 314,000 cm^3/min.
   D. 414,000 cm^3/min.
   E. 514,000 cm^3/min.

6. The biological half-life of morphine is 2.5 hours. If a person has 20 mg of morphine in their blood now, how long will it be until they have just 2 mg of morphine in their blood, in hours?

   A. $\dfrac{10\ln(2)}{2\ln(5)}$

   B. $-\dfrac{5\ln(2)}{2\ln(10)}$

   C. $\dfrac{2\ln(10)}{5\ln(2)}$

   D. $-\dfrac{2\ln(5)}{10\ln(2)}$

   E. $\dfrac{5\ln(10)}{2\ln(2)}$

7. A kite 100 ft above the ground moves horizontally at a speed of 13 ft/s. At what rate is the length of the string increasing when 260 ft of string have been let out?
   NOTE: $100^2 + 240^2 = 260^2$.

   A. 10 ft/s.

   B. 11 ft/s.

   C. 12 ft/s.

   D. 13 ft/s.

   E. 14 ft/s.