

AP CALCULUS

CREATE THE

QUIZ

WE BEGIN OUR STORY
IN NEW YORK

1 Find the derivative of $\ln|\cos \sqrt{x-13}|$.

- A. $-\tan \sqrt{x-13} / 2\sqrt{x-13}$
- B. $\sin \sqrt{x-13} \sec \sqrt{x-13} / 2\sqrt{x-13}$
- C. $-\tan \sqrt{x-13}$
- D. $\sec \sqrt{x-13} / 2\sqrt{x-13}$

3 Let $f(x) = (e^x + e^{-x} + 2) / (e^x + 1)$. What is $f'(x)$?

- A. $e^x - 2e^{-x}$
- B. e^{-x}
- C. $-e^x$
- D. $-e^{-x}$

4 Apple Music released the 1989 Tour Movie on Dec. 20. Normally, the

rate (streams/day) that swifties stream the movie can be modeled by $S(t) = 600e^{-x/70} + \cos(2/7 \pi x) + 1$, where t is the number of days since the release. This model **does not work for the holiday period from** Dec. 20 to Jan. 3 ($t = [0, 14]$), but Apple's servers counted 22,000 streams during this interval. Using **calculus**, **which is then the** best prediction for the total number of streams the 1989 Movie will have by May 8th ($t = 140$)?

- A. $42,000/\sqrt[5]{e} - 42,000/e^2 + 126$
- B. $42,000/\sqrt[5]{e} - 42,000/e^2 + 22126$

C. $42,000/\sqrt[5]{e} - 42,000/e^2 + 140$

D. $-42000/e^2 + 7/2\pi \sin(40\pi) + 140$

Correct answer: B

$$\int S(t) = -42000e^{-x/70} + 7/2\pi \sin(2/7 \pi x) + x + c$$

$$\int_0^{14} S(t) = 22000$$

$$\begin{aligned}\int_{14}^{140} S(t) &= (-42000/e^2 + 7/2\pi \sin(40\pi) + 140) - \\ &\quad (-42,000/\sqrt[5]{e} + 7/2\pi \sin(4\pi) + 14) \\ &= 42,000/\sqrt[5]{e} - 42,000/e^2 + 126\end{aligned}$$

$$\begin{aligned}\int_0^{140} S(t) &= \int_0^{14} S(t) + \int_{14}^{140} S(t) \\ &= 22000 + 42,000/\sqrt[5]{e} - 42,000/e^2 + 126 \\ &= 42,000/\sqrt[5]{e} - 42,000/e^2 + 22126\end{aligned}$$