

# AP Calculus Homework 9

Please write your answer on a separate piece of paper and submit it on Classkick or write your answer directly on Classkick.

Please write all answers in exact forms. For example, write  $\pi$  instead of 3.14.

Questions with a \* are optional. Questions with \*\* are optional and more challenging.

1. Find the most general antiderivative of the function.

a)  $f(x) = 6\sqrt{x} - \sqrt[6]{x}$       b)  $g(\theta) = \cos \theta - 5 \sin \theta$       c)\*  $f(x) = 2\sqrt{x} + 6 \cos x$

2. Find  $f$ .

a)  $f'(x) = \sqrt{x}(6 + 5x)$ ,  $f(1) = 10$       b)  $f'(x) = 2x - 3/x^4$ ,  $x > 0$ ,  $f(1) = 3$

c)  $f''(t) = 2e^t + 3 \sin t$ ,  $f(0) = 0$ ,  $f(\pi) = 0$

d)\*  $f''(x) = x^{-2}$ ,  $x > 0$ ,  $f(1) = 0$ ,  $f(2) = 0$

3. A stone was dropped off a cliff and hit the ground with a speed of 120 ft/s. What is the height of the cliff?

4.\*\* A car is travelling at 100 km/h when the driver sees an accident 80 m ahead and slams on the brakes. What constant deceleration is required to stop the car in time to avoid a pileup?

5. Express the limit as a definite integral on the given interval.

a)  $\lim_{n \rightarrow \infty} \sum_{i=1}^n x_i \ln(1 + x_i^2) \Delta x$ ,  $[2, 6]$       b)  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt{2x_i^* + (x_i^*)^2} \Delta x$ ,  $[1, 8]$

6. Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function.

a)  $g(x) = \int_1^x \frac{1}{t^3 + 1} dt$       b)  $F(x) = \int_x^\pi \sqrt{1 + \sec t} dt$       c)\*  $G(x) = \int_x^1 \cos \sqrt{t} dt$

7. Evaluate the integral (pick any five problems)

a)  $\int_1^4 (5 - 2t + 3t^2) dt$       b)  $\int_1^8 \sqrt[3]{x} dx$       c)  $\int_\pi^{2\pi} \cos \theta d\theta$

d)  $\int_1^9 \frac{x-1}{\sqrt{x}} dx$       e)  $\int_0^{\pi/4} \sec \theta \tan \theta d\theta$       f)  $\int_1^2 (1 + 2y)^2 dy$

g)  $\int_1^9 \frac{1}{2x} dx$       h)  $\int_{-1}^1 e^{u+1} du$        $\int_1^2 \frac{4 + u^2}{u^3} du$

8. If  $f(1) = 12$ ,  $f'$  is continuous, and  $\int_1^4 f'(x)dx = 17$ , what is the value of  $f(4)$ ?