

The following questions are similar to the questions in the Calculus Placement Exam.

CALCULUS

1. If $f(x) = 1 - 3 \cos x$, find $f'\left(\frac{\pi}{2}\right)$.

2. If $f(x) = \sin(\pi x)$, find $f'\left(\frac{1}{2}\right)$.

3. Find the first derivative of the following functions:

a) $f(x) = \sqrt{1 + \sin x}$ b) $f(x) = \tan\left(\frac{\pi}{x^2}\right)$ c) $f(x) = \frac{\sin x}{x^2 + 2}$ d) $f(x) = x \cos 2x$.

4. Find the equation of the line tangent to the graph of $f(x) = \sqrt{x+1}$ at the point (3,2).

5. Compute the indicated limits

a) $\lim_{x \rightarrow 3} \frac{x^2 - 6x + 9}{x^2 - 2x - 3}$ b) $\lim_{x \rightarrow 1^-} \frac{|x-1|}{x-1}$ c) $\lim_{x \rightarrow 0} \frac{x}{\sin(\pi x)}$.

6. Suppose $h(x) = \frac{x}{x^2 + 1}$.

- For which intervals h is increasing?
- For what x will h have a relative minimum?
- Find the horizontal asymptote for the graph of h .
- Sketch the graph of h .

7. If $f(x) = \frac{1}{\sec x}$ for $x \neq \frac{\pi}{2}$, find a value for $f\left(\frac{\pi}{2}\right)$ which will make f continuous at $\frac{\pi}{2}$.

8. If $-3 \sin x = \tan y + y$, find $\frac{dy}{dx}$ at the point (0, 0).

9. A child flies a kite at a height of 300 feet. The wind carries the kite horizontally at a rate of 10 ft/sec. How fast must the child play out string when the kite is 500 feet from him?

10. Two positive numbers have the property that their product is 2 and their sum is as small as possible. Find their sum.