

AP Calculus AB
Unit 2 Worksheet 6

State whether or not each of the following functions is continuous. If not, state where the discontinuity occurs and whether or not it is removable. Is the discontinuity an asymptote, a hole, or a jump? If it is an asymptote, what is its equation?

1) $f(x) = \frac{x}{x^2 + 1}$

2) $f(x) = \frac{x}{2x^2 - x - 1}$

3) $f(x) = \frac{2x + 3}{x^2 - x - 6}$

4) $f(x) = \frac{x - 4}{x^2 - 16}$

5) $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3} & \text{if } x \neq 3 \\ 8 & \text{if } x = 3 \end{cases}$

6) $f(x) = \begin{cases} 2x - 3 & \text{if } x \leq 2 \\ x^2 & \text{if } x > 2 \end{cases}$

7) $f(x) = \begin{cases} x^3 & \text{if } x < -1 \\ x & \text{if } -1 \leq x < 1 \\ 1 - x & \text{if } x \geq 1 \end{cases}$

8) $f(x) = \frac{x}{|x| - 3}$

Find the value of “a” and/or “b” for which the function is continuous.

$$9) f(x) = \begin{cases} 7x - 2 & \text{if } x \leq 1 \\ ax^2 & \text{if } x > 1 \end{cases}$$

$$10) f(x) = \begin{cases} ax^2 & \text{if } x \leq 2 \\ 2x + a & \text{if } x > 2 \end{cases}$$

$$11) f(x) = \begin{cases} x + 1 & \text{if } x < 1 \\ ax + b & \text{if } 1 \leq x < 2 \\ 3x & \text{if } x \geq 2 \end{cases}$$

Are the following functions continuous at all points in the natural domain? If the function is not continuous, does it have a removable discontinuity? If it has a removable discontinuity, create a continuous function.

$$12) f(x) = \frac{x^2 - 16}{x + 4}$$

$$13) f(x) = \frac{2x^2 - x - 1}{x - 1}$$

$$14) f(x) = \frac{9x^2 - 4}{3x + 2}$$

$$15) g(t) = \frac{\sin t}{t}$$