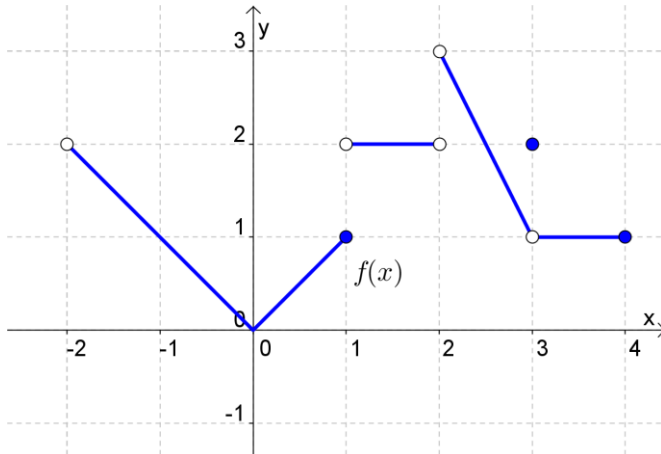


Due date: _____

Name: _____

1.



Is f continuous or discontinuous at each x -value? Is f continuous or discontinuous from the left? Is f continuous or discontinuous from the right? Show/explain your reasoning.

 $x = 0$

continuous at $x = 0$ discontinuous at $x = 0$ (circle one)

continuous from the left at $x = 0$ discontinuous from the left at $x = 0$ (circle one)

continuous from the right at $x = 0$ discontinuous from the right at $x = 0$ (circle one)

 $x = 1$

continuous at $x = 1$ discontinuous at $x = 1$ (circle one)

continuous from the left at $x = 1$ discontinuous from the left at $x = 1$ (circle one)

continuous from the right at $x = 1$ discontinuous from the right at $x = 1$ (circle one)

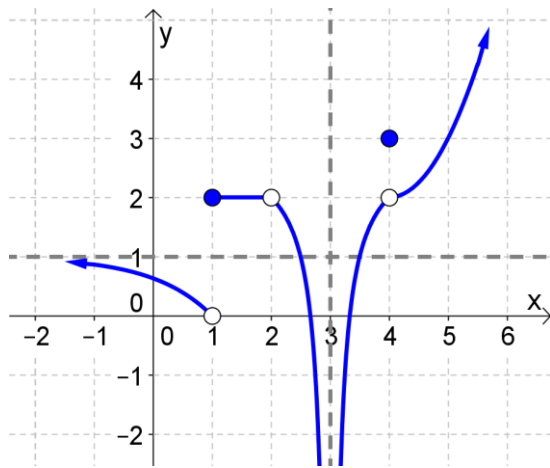
 $x = 3$

continuous at $x = 3$ discontinuous at $x = 3$ (circle one)

continuous from the left at $x = 3$ discontinuous from the left at $x = 3$ (circle one)

continuous from the right at $x = 3$ discontinuous from the right at $x = 3$ (circle one)

2.



Is f continuous or discontinuous at each x -value? Is f continuous or discontinuous from the left? Is f continuous or discontinuous from the right? Show/explain your reasoning.

$x = 1$

continuous at $x = 1$ discontinuous at $x = 1$ (circle one)

continuous from the left at $x = 1$ discontinuous from the left at $x = 1$ (circle one)

continuous from the right at $x = 1$ discontinuous from the right at $x = 1$ (circle one)

$x = 2$

continuous at $x = 2$ discontinuous at $x = 2$ (circle one)

continuous from the left at $x = 2$ discontinuous from the left at $x = 2$ (circle one)

continuous from the right at $x = 2$ discontinuous from the right at $x = 2$ (circle one)

$x = 3$

continuous at $x = 3$ discontinuous at $x = 3$ (circle one)

continuous from the left at $x = 3$ discontinuous from the left at $x = 3$ (circle one)

continuous from the right at $x = 3$ discontinuous from the right at $x = 3$ (circle one)

3. Explain why $f(x) = \begin{cases} x^2 - 1 & \text{if } x \leq 1 \\ 1 + \log_2 x & \text{if } x > 1 \end{cases}$ is discontinuous at $x = 1$.

4. Explain why $f(x) = \begin{cases} 3 - x^2 & \text{if } x \leq -1 \\ \frac{3}{x+1} & \text{if } x > -1 \end{cases}$ is discontinuous at $x = -1$.

5. Find all values of c such that $f(x) = \begin{cases} 2x - 6 + c^2 & \text{if } x < 3 \\ \frac{c}{x-1} & \text{if } x \geq 3 \end{cases}$ is continuous on $(-\infty, \infty)$.

6. Find the value of c such that $f(x) = \begin{cases} 2 + \sqrt{x} & \text{if } 0 \leq x \leq 1 \\ \ln cx & \text{if } x > 1 \end{cases}$ is continuous on $[0, \infty)$.

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7. How would you define $f(-1)$ in a way that makes $f(x) = \frac{x+1}{x^2-2x-3}$ continuous at $x = -1$?
8. How would you define $f(0)$ in a way that makes $f(x) = x^2 \sin \frac{1}{x}$ continuous at $x = 0$?
9. Write the definition of what it means for a function $f(x)$ to be continuous at $x = a$.
10. Sketch the graph of a function that is discontinuous at $x = 3$, but is continuous from the right at $x = 3$.
11. Sketch the graph of a function that is discontinuous at $x = -2$ and $x = 1$, but is continuous from the left at $x = -2$ and is continuous from the right at $x = 1$.

12. Use the Intermediate Value Theorem to show that there is a root of $x^3 = x - 1$ in the interval $(-2, -1)$.

13. Use the Intermediate Value Theorem to show that there is a root of $\cos(x - \pi) = 1 - x$ in the interval $(\frac{\pi}{4}, \frac{\pi}{2})$.

14. Use the Intermediate Value Theorem to show that there is a zero of $f(x) = e^x + 2x - 3$ in the interval $(0, 1)$.

Review

15. True or false: If $P(x)$ is a polynomial, then $\lim_{x \rightarrow a} P(x) = P(a)$.

16. True or false: If P and Q are polynomials, then it is always true that $\lim_{x \rightarrow a} \frac{P(x)}{Q(x)} = \frac{P(a)}{Q(a)}$.

17. True or false: $f(x) = \frac{(x-2)(x+1)}{x+1}$ is undefined at $x = -1$.

18. True or false: If $\lim_{x \rightarrow \infty} f(x) = 3$, then f has a vertical asymptote $x = 3$.

19. True or false: If $\lim_{x \rightarrow 2^-} f(x) = -\infty$, then f has a vertical asymptote $x = -2$.

Q: A man while looking at a photograph said, "Brothers and sisters have I none. That man's father is my father's son." Who was the person in the photograph?

Optional exercises from the Stewart textbook if you'd like more practice:

2.5 (p.124) #3-7 odd, 17-23 odd, 41-45 odd, 53, 55