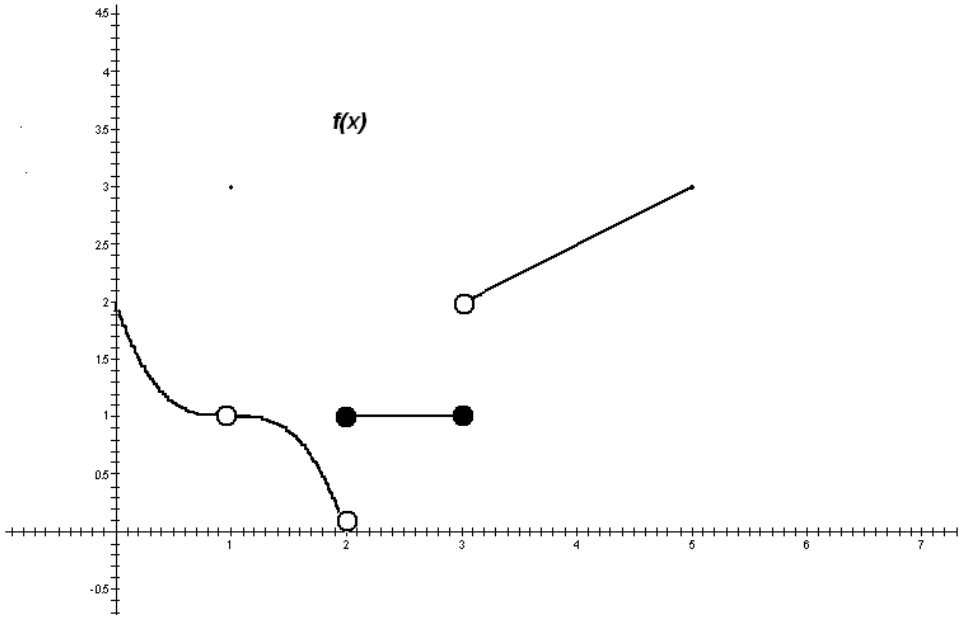
1. Find the value of each of the following. If the value does not exist or is undefined, write DNE.



a. $\lim_{x\to 1+} f(x) =$

b. $\lim_{x\to 1-} f(x) =$

c. $\lim_{x\to 1} f(x) =$

d. $f(1) =$

e. $\lim_{x\to 2+} f(x) =$

f. $\lim_{x\to 2-} f(x) =$

g. $\lim_{x\to 2} f(x) =$

h. $f(2) =$

i. $\lim_{x\to 3+} f(x) =$

j. $\lim_{x\to 3-} f(x) =$

k. $\lim_{x\to 3} f(x) =$

l. $f(3) =$

2. True or False? Explain each answer.

a. $f(x)$ is continuous at $x = 1$

b. $f(x)$ is differentiable at $x = 1$

c. $f(x)$ is continuous at $x = 2$

d. $f(x)$ is differentiable at $x = 2$

e. $f(x)$ is continuous at $x = 3$

f. $f(x)$ is differentiable at $x = 3$

g. $f(x)$ is continuous at $x = .5$

h. $f(x)$ is differentiable at $x = 4$

3. Use the definition of the derivative (left and right hand limit tables) to find $f'(3)$ for $f(x) = \log(x)$.

4. Use Fermat's method (with the limits, not our rules) to find $\frac{dy}{dx}$ for $y = \frac{1}{x}$ .Simplify completely (You should know the answer by the power rule, but be sure to show all steps using Fermat's method.)

5. I pace back and forth in and out of my office because I keep forgetting things. My distance from my office door in feet is given by the formula $f(t) = t\sin(t)$ for $0 \le t \le 12$ seconds. Consider positive values to be outside my office and negative values to be inside my office.

    a. Graph the function and estimate the time at which I am furthest from my office door. Am I inside or outside my office? Sketch a graph of the function and clearly identify this point.

    b. Find the value of the derivative of $f'(t)$ at the point you found in part (a) and explain why this value makes sense in the context of concepts we have discussed in this class.

    c. How fast am I going at 5 seconds? Am I moving toward my office or away from it? How can you tell?