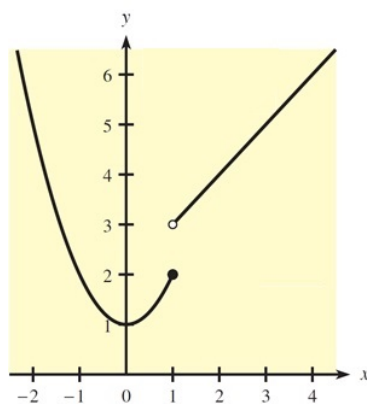


MTH 151
Exam 1
Fall 2018

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

Graphing calculator OK but not one with CAS (e.g., no TI-89, no TIInspire).

1. (12 pts.) This figure shows the graph of $y = f(x)$.



For each of these, find the value or state that it does not exist.

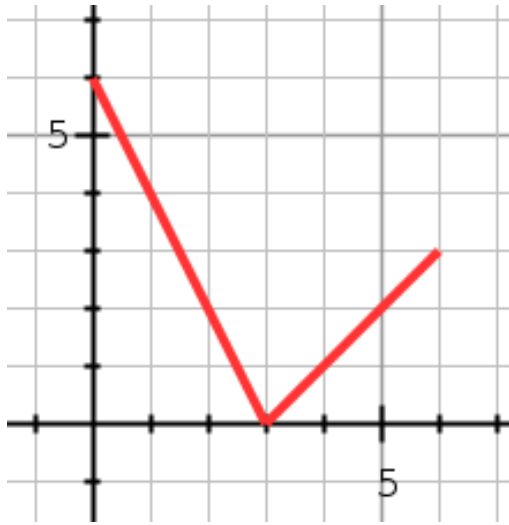
(a) $\lim_{x \rightarrow 1^-} f(x)$

(b) $\lim_{x \rightarrow 1^+} f(x)$

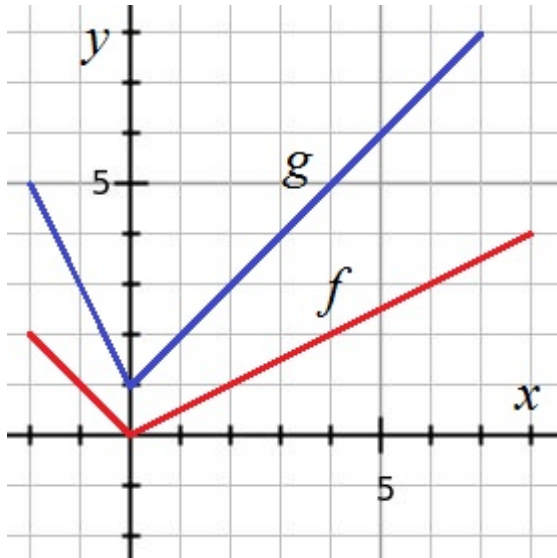
(c) $\lim_{x \rightarrow 1} f(x)$

(d) $f(1)$

2. (10 pts.) Find a piecewise expression for the function whose graph is the given curve.



3. (10 pts.) Consider the given graphs of f and g .



Evaluate each expression, or explain why it is undefined.

(a) $f(g(1))$

(b) $(f \circ g)(3)$

(c) $(g \circ f)(6)$

(d) $(g \circ g)(2)$

(e) $(f \circ f)(4)$

4. (10 pts.) Consider the given function.

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

(a) Find the numbers (x -values) at which f is discontinuous.

(b) For each number from part (a), is f continuous from the right, from the left, or neither?

(c) Sketch the graph of f .

5. (10 pts.) Find the derivative of the function f “the long way,” using the definition of derivative.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

Neatly show all important algebraic steps to justify your answer.

$$f(x) = \frac{2}{5+x}$$

6. Differentiate each function. You do not have to simplify your answers.

(a) (6 pts.) $y = x^3 \tan x$

(b) (6 pts.) $y = \frac{x^4 + 4x}{x^2 - 5x + 4}$

(c) (6 pts.) $y = \frac{\sec x}{1 + \sin x}$

6. (Continued) Differentiate each function. You do not have to simplify your answers.

(d) (6 pts.) $y = (5x - 3)^6(x^3 + x + 1)^4$

(e) (6 pts.) $y = \cos^2(\tan x)$

7. (8 pts.) Find the limit (show work to justify your answer).

$$\lim_{t \rightarrow 0} \frac{\tan 8t}{\sin 3t}$$

8. (10 pts.) Find dy/dx by implicit differentiation.

$$x^4 + x^3y^3 + y^4 = 10$$