

## Homework 3; Due Thursday, 03/23/2017

**Question 1.** In the following exercises, study the continuity of  $f$  on the real line (i.e., identify intervals of continuity, point(s) of discontinuity and the reason for said discontinuity)

$$(a) f(x) = \begin{cases} x^3 - 2 & \text{if } x \leq 2 \\ x - 2x^2 - 1 & \text{if } x > 2 \end{cases}$$

$$(b) f(x) = \begin{cases} x^2 - \frac{1}{2}x + 1 & \text{if } x \leq 1 \\ \frac{3x}{x+1} & \text{if } x > 1 \end{cases}$$

**Question 2.** For the following, find the values of  $a$  for which the function  $f$  is continuous on  $\mathbb{R}$ .

$$(a) f(x) = \begin{cases} x - a & \text{if } x \leq 0 \\ x^2 + 1 & \text{if } x > 0 \end{cases}$$

$$(b) f(x) = \begin{cases} -2x - a^2 & \text{if } x \leq 1 \\ 1 - 4ax & \text{if } x > 1 \end{cases}$$

**Question 3.** For the following exercises, give an example of a function  $f$  as specified.

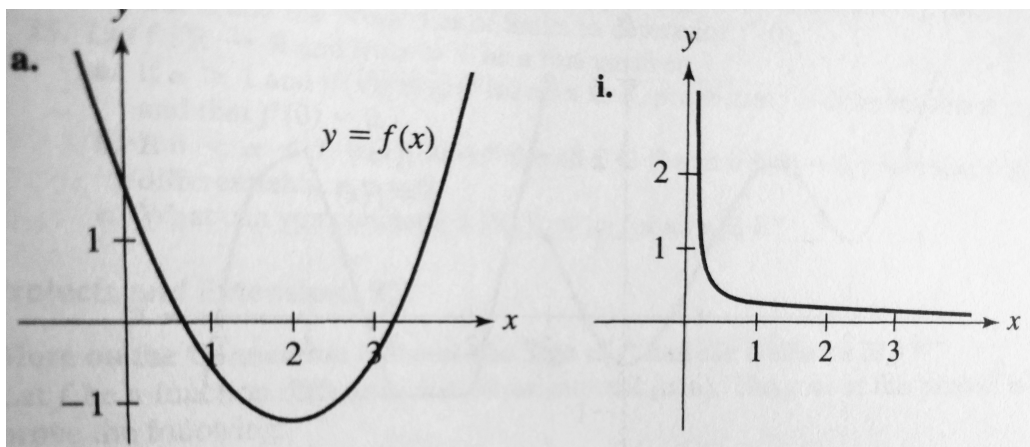
(a)  $f$  is continuous at  $x = 2$ .

(b)  $\lim_{x \rightarrow 2} f(x)$  exists, and  $f$  is discontinuous at  $x = 2$ .

(c)  $\lim_{x \rightarrow 2^-} f(x) = f(2)$ , and  $f$  is discontinuous at  $x = 2$ .

**Question 4.** Determine the equation of the tangent line to the curve  $y = -3x^2 + 5x - 2$  at the point  $(1, 0)$ .

**Question 5.** Match each function a–c with the graph of its derivative i–iii.



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