Lecture 13 Section 4.5 Some Max-Min Problems

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Test 1

- The written questions on Test 1 have been graded on Monday, and should appear as a separate column in your CourseWare gradebook by Wednesday.
- You will have to add the two columns to get your total score on the exam.

Quiz 1

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Give the number of critical values of f.

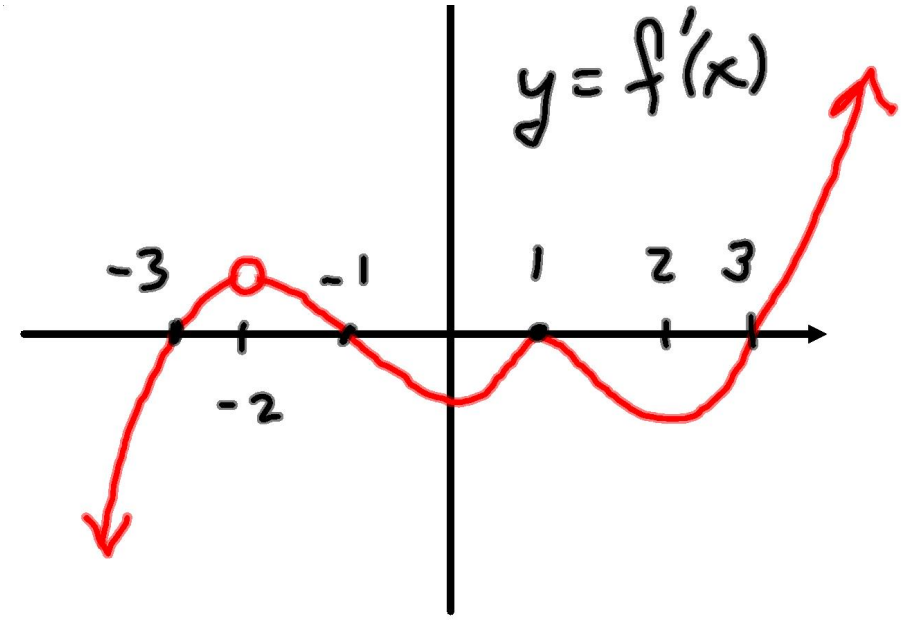
a. 2

b. 3

c. 4

d. 5

e. None of these



Quiz 2

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Give the number of local minima of f.

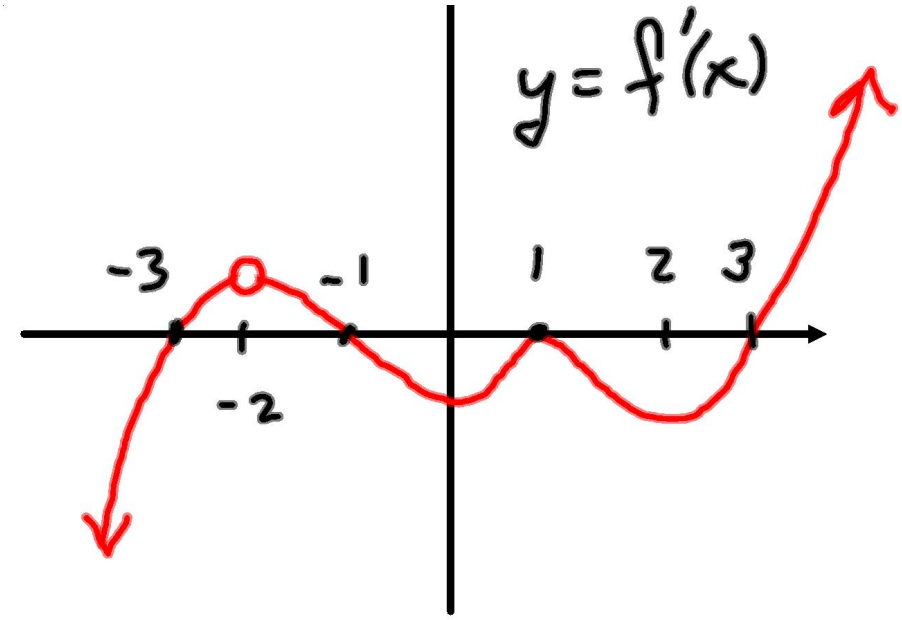
a. 1

b. 2

c. 3

d. 4

e. None of these



Quiz 3

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Give the number of local maxima of f.

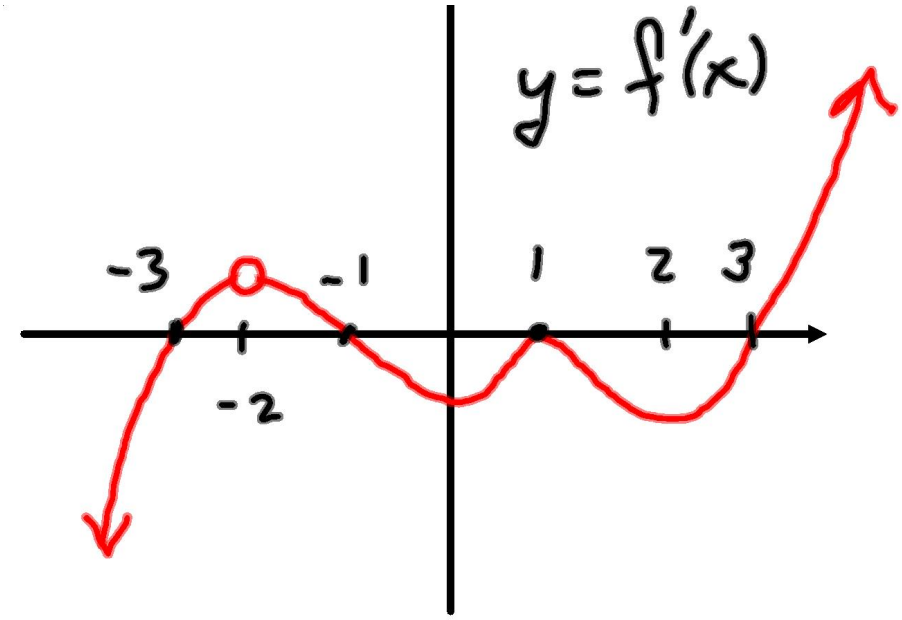
a. 1

b. 2

c. 3

d. 4

e. None of these



Quiz 4

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Give the number of intervals of increase of f.

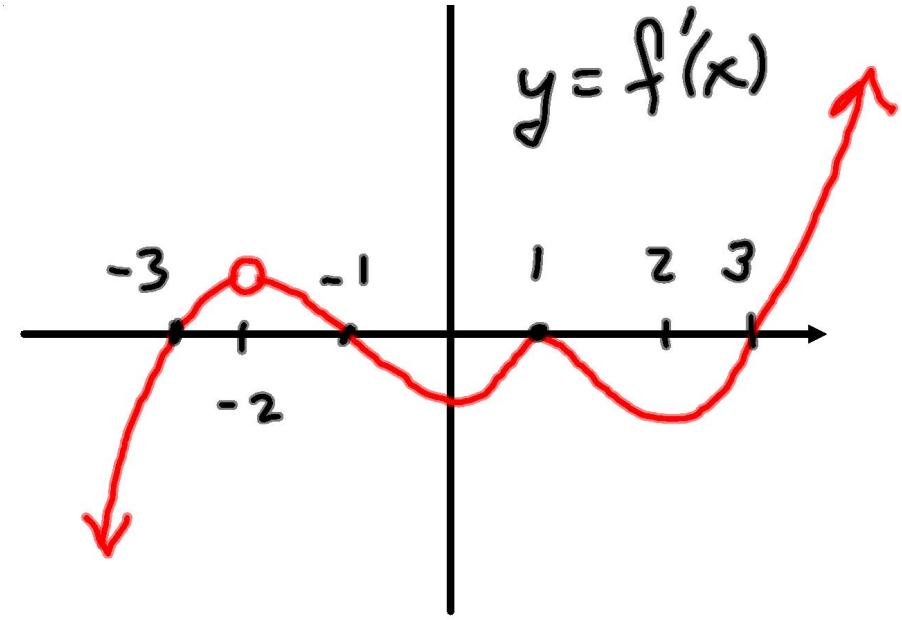
a. 1

b. 2

c. 3

d. 4

e. None of these



Quiz 5

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Give the number of intervals of decrease of f.

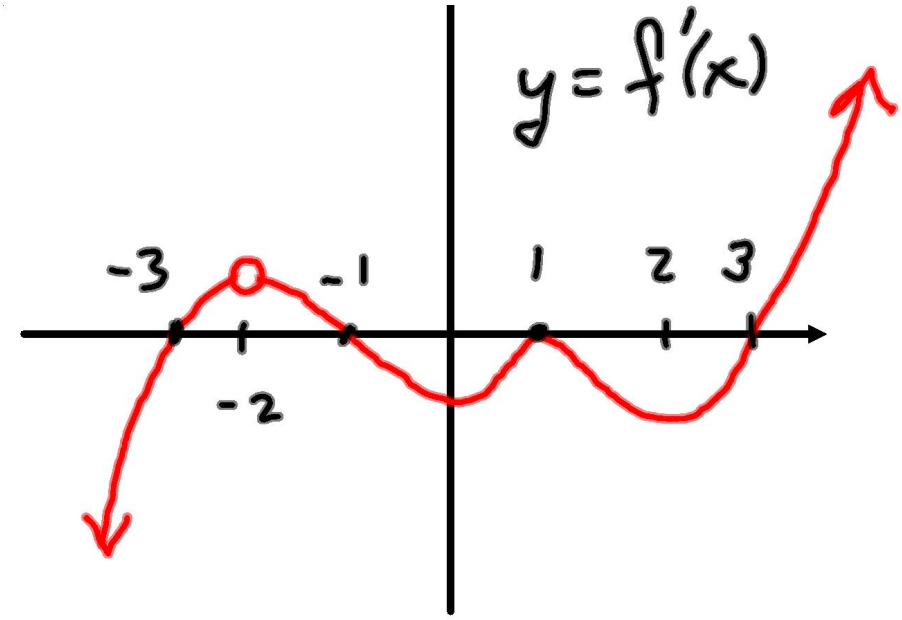
a. 1

b. 2

c. 3

d. 4

e. None of these



Quiz 6

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at -3 or state that the value is not a critical value.

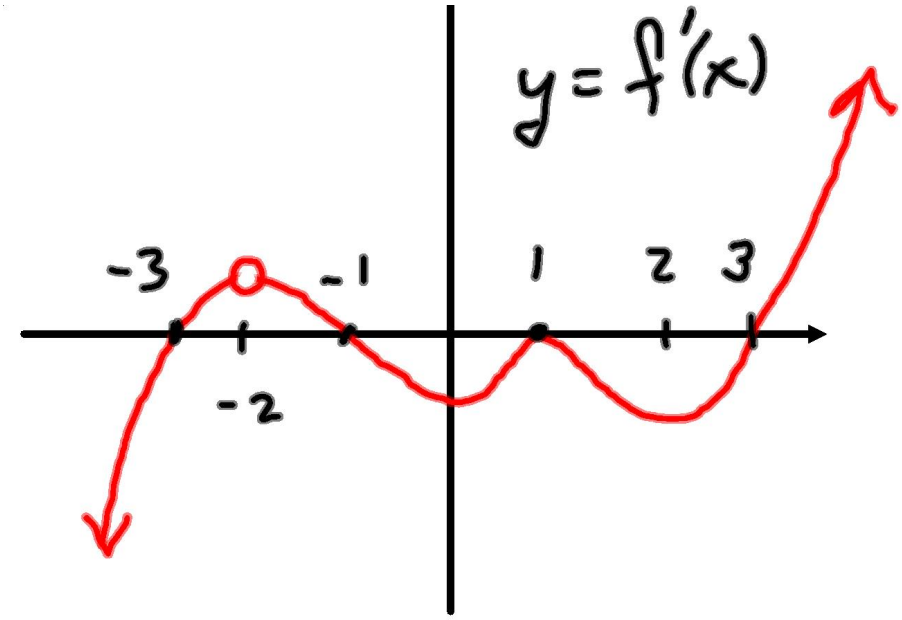
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 7

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at -2 or state that the value is not a critical value.

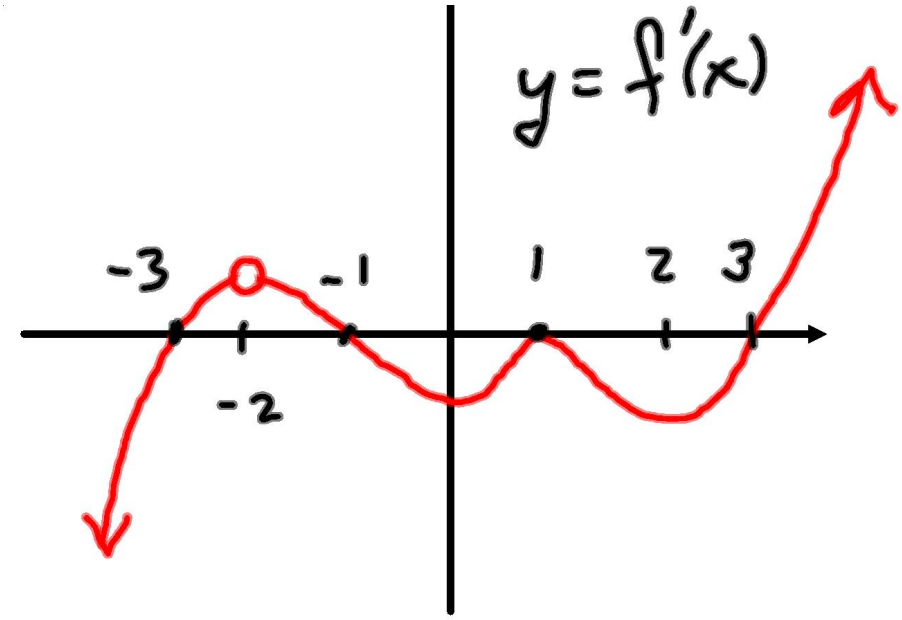
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 8

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at -1 or state that the value is not a critical value.

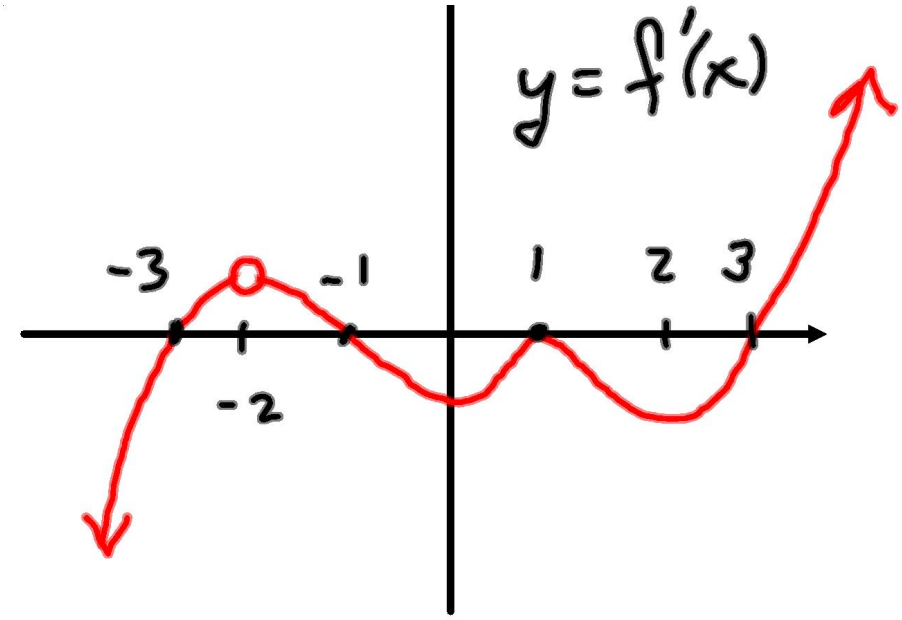
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 9

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at 0 or state that the value is not a critical value.

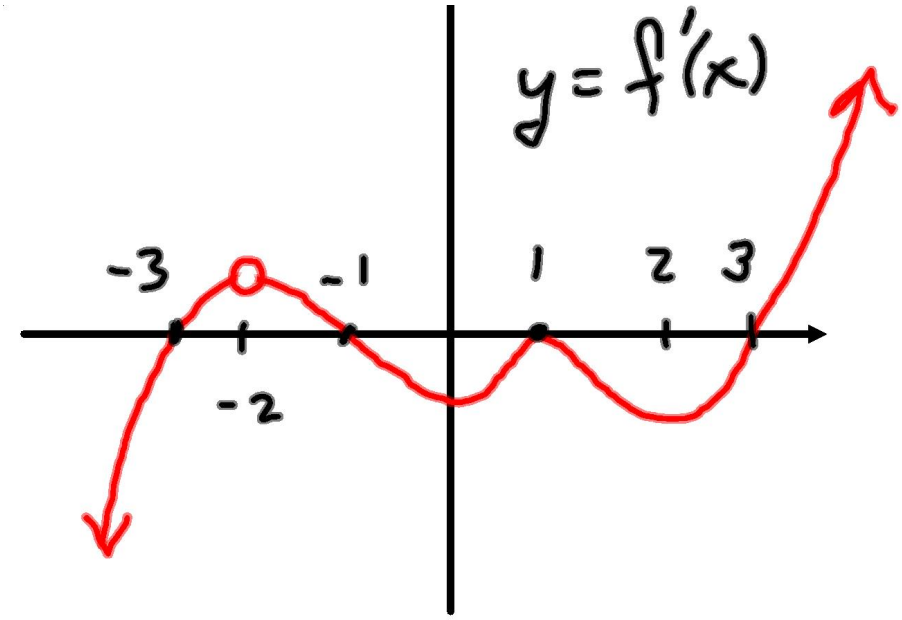
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 10

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at 1 or state that the value is not a critical value.

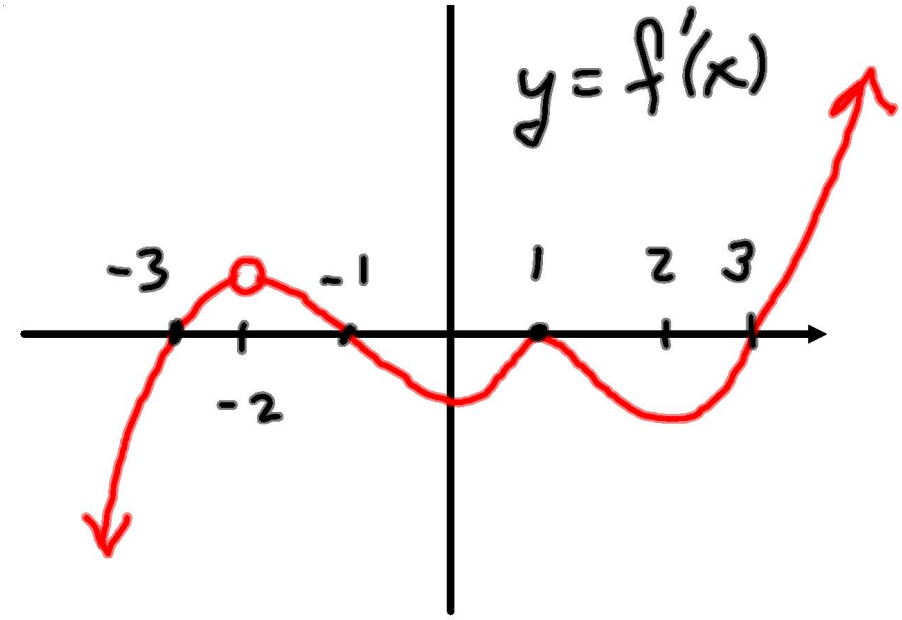
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 11

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at 2 or state that the value is not a critical value.

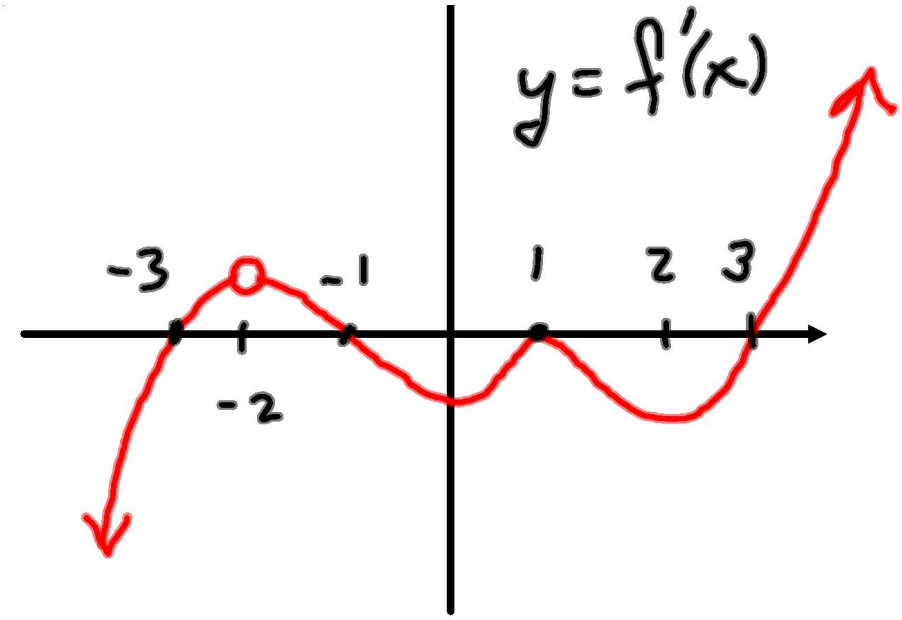
a. local maximum

b. local minimum

c. neither

d. not a critical value

e. None of these



Quiz 12

Assume the domain of f is all real numbers. The graph of $f'(x)$ is shown below. Classify the critical value at 3 or state that the value is not a critical value.

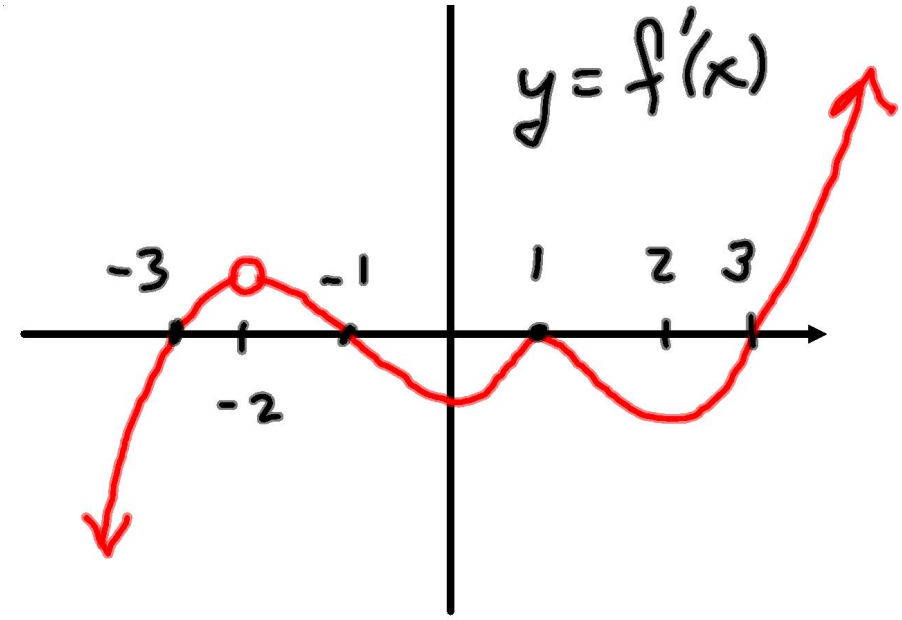
a. local maximum

b. local minimum

c. neither

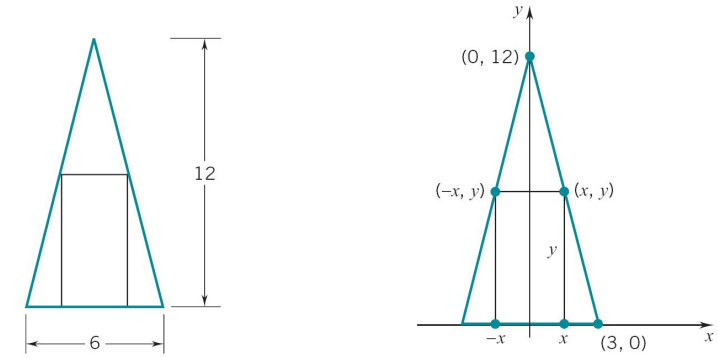
d. not a critical value

e. None of these



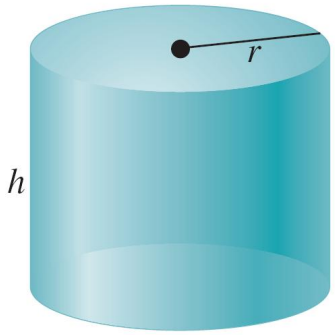
1 Section 4.5 Some Max-Min Problems

Example 1



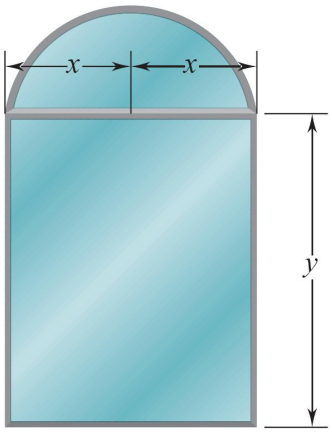
Example 1 An isosceles triangle has a base of 6 units and a height of 12 units. Find the maximum possible area of a rectangle that can be placed inside the triangle with one side resting on the base of the triangle. What are the dimensions of the rectangle(s) of maximum area?

Example 2



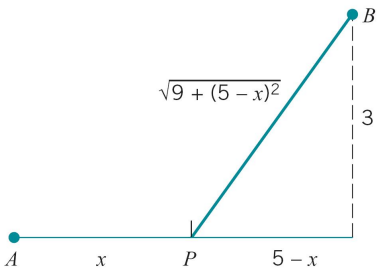
Example 2 A soft-drink manufacturer wants to fabricate cylindrical cans for its product. The can is to have a volume of 12 fluid ounces, which is approximately 22 cubic inches. Find the dimensions of the can that will require the least amount of material. See Figure 4.5.3.

Example 3



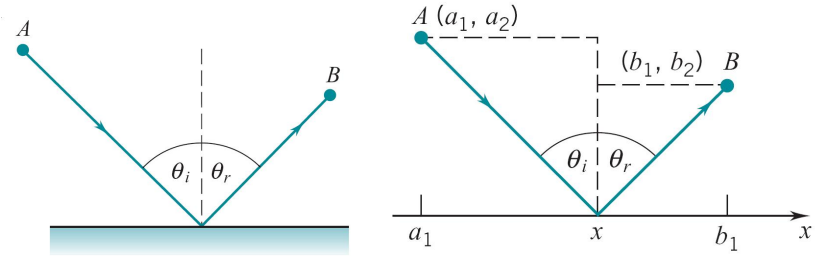
Example 3 A window in the shape of a rectangle capped by a semicircle is to have perimeter p. Choose the radius of the semicircular part so that the window admits the greatest amount of light.

Example 4



Example 4 A state highway department plans to construct a new road between towns A and B. Town A lies on an abandoned road that runs east-west. Town B is 3 miles north of the point on that road that is 5 miles east of A. The engineering division proposes that the road be constructed by restoring a section of the old road from A up to a point P and joining it to a new road that connects P and B. If the cost of restoring the old road is \$200,000 per mile and the cost of the new road is \$400,000 per mile, how much of the old road should be restored in order to minimize the department's costs?

Example 5



Example 5 (*The angle of incidence equals the angle of reflection.*) Figure 4.5.6 depicts light from a point A reflected to a point B by a mirror. Two angles have been marked: the *angle of incidence*, θ_i, and the *angle of reflection*, θ_r. Experiment shows that $\theta_i = \theta_r$. Derive this result by postulating that the light that travels from A to the mirror and then to B follows the shortest possible path.†

Example 6

Example 6 A manufacturing plant has a capacity of 25 articles per week. Experience has shown that n articles per week can be sold at a price of p dollars each where $p = 110 - 2n$ and the cost of producing n articles is $600 + 10n + n^2$ dollars. How many articles should be made each week to give the largest profit?

n	P	n	P	n	P
8	8	14	212	20	200
9	57	15	225	21	177
10	100	16	232	22	148
11	137	17	233	23	113
12	168	18	228	24	72
13	193	19	217	25	25