1.2 Functions and Their Properties
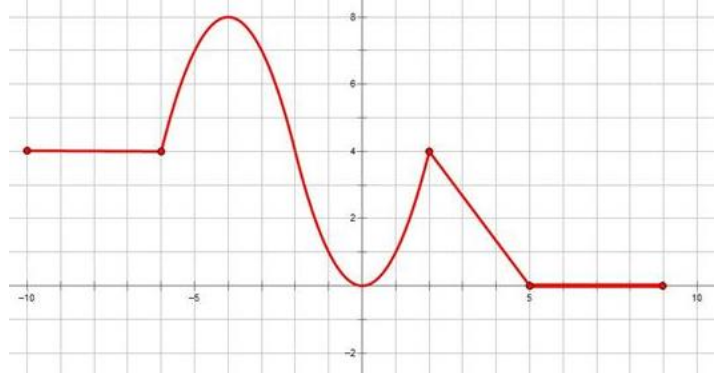### Increasing/Decreasing, Maxima/Minima, Boundedness of Functions
Target 1A: Analyze functions using specific properties

Review of Prior Concepts

A graph of $f(x)$ is given at the right.
1. On what interval(s) is $f(x)$ increasing?

2. On what interval(s) is $f(x)$ decreasing?

More Practice

Intervals of Increasing/Decreasing
https://www.youtube.com/watch?v=r9cWE-kkU7A
http://braingenie.ck12.org/skills/105853?assignment=25581
https://www.mathsisfun.com/sets/functions-increasing.html

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SAT Connection
Problem Solving and Data Analysis
**5.** Use the relationship between two variables to investigate key features of the graph.
Example:

John runs at different speeds as part of his training program. The graph shows his target heart rate at different times during his workout. On which interval is the target heart rate strictly increasing then strictly decreasing?
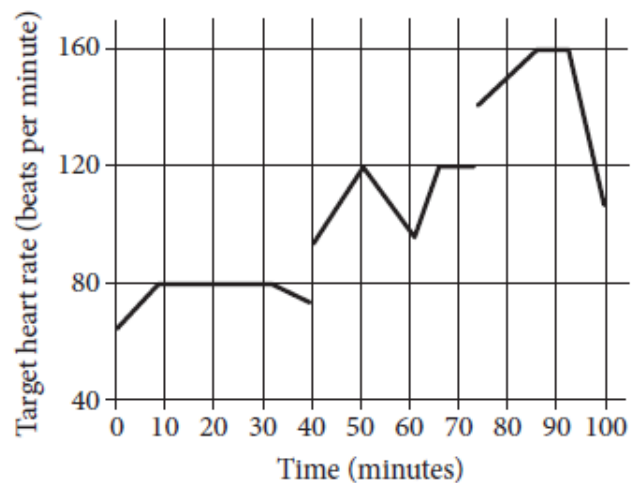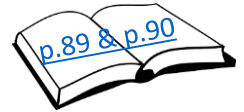
A) Between 0 and 30 minutes

B) Between 40 and 60 minutes

C) Between 50 and 65 minutes

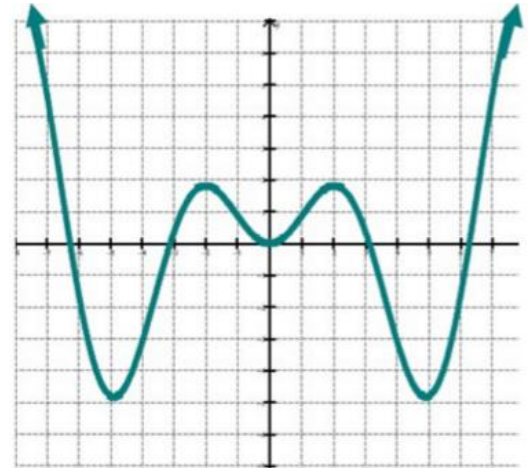D) Between 70 and 90 minutes

Solution

Local Maxima & Minima
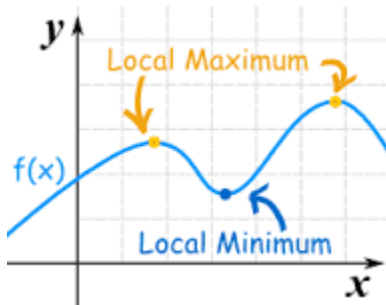
In your words,

Local Maximum Value

Local Minimum Value
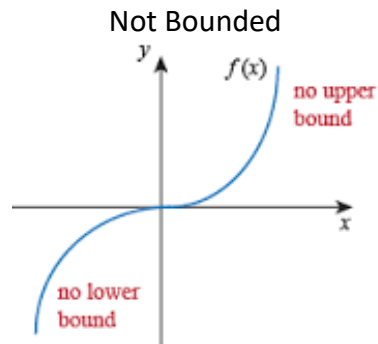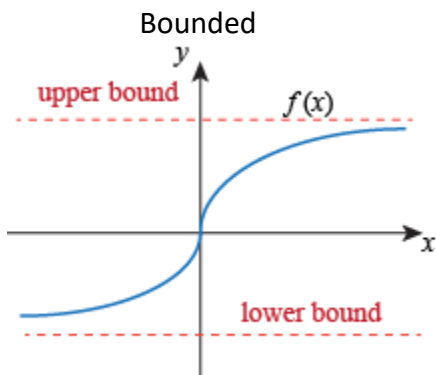
p.89 & p.90

Example 1: A graph of $g(x)$ is given at the right.

a) Identify any local minimum point(s).

b) Identify any local minimum value(s).

c) Identify any x-value(s) where a local minimum occurs.

Boundedness

Bounded Above

upper bound

$f(x) = -x^2$

no lower bound

Bounded Below

$f(x)$

no upper bound

lower bound

0

Bounded

upper bound

$f(x)$

lower bound

Not Bounded

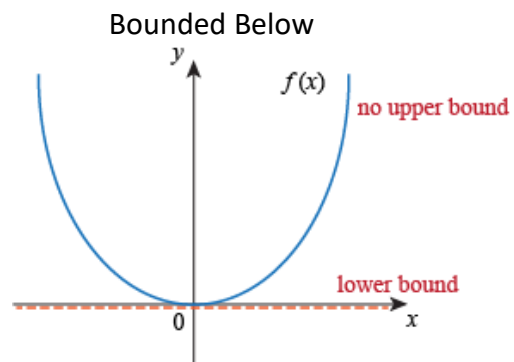$f(x)$

no upper bound

no lower bound

Example 2: A graph of $g(x)$ is given at the right.

a) Identify any local minimum value(s).

b) Identify any local maximum value(s).

c) Is the function bounded above, bounded below, bounded, or not bounded on its domain?
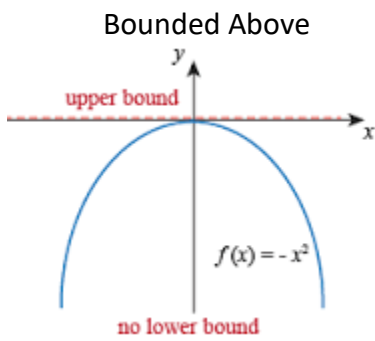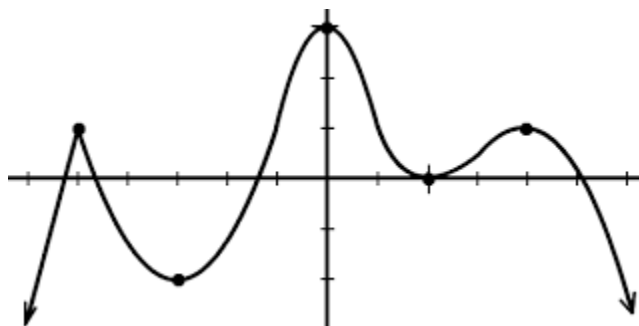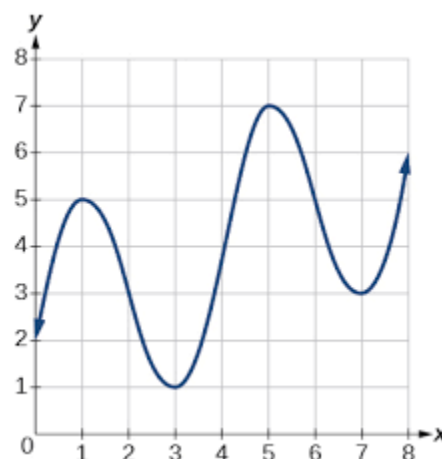
Example 3: A graph of $g(x)$ is given at the right.

a) Identify any local minimum value(s).

b) Identify any local maximum value(s).

c) Is the function bounded above, bounded below, bounded, or not bounded on its domain?

More Practice

Maxima/Minima
http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/12-relative-extrema-minimums-maximums-01
https://www.youtube.com/watch?v=07DxrU5ZCEc
https://www.youtube.com/watch?v=hmyM7fVHp8M
Boundedness
https://www.youtube.com/watch?v=ct5-NGtfBRk
http://www.vitutor.com/calculus/functions/bounded_functions.html

Homework Assignment
p.95 #22,23,24,25,27,30,33

Solution

Choice B is correct. On the graph, a line segment with a positive slope represents an interval over which the target heart rate is strictly increasing as time passes. A horizontal line segment represents an interval over which there is no change in the target heart rate as time passes, and a line segment with a negative slope represents an interval over which the target heart rate is strictly decreasing as time passes. Over the interval between 40 and 60 minutes, the graph consists of a line segment with a positive slope followed by a line segment with a negative slope, with no horizontal line segment in between, indicating that the target heart rate is strictly increasing then strictly decreasing.

Choice A is incorrect because the graph over the interval between 0 and 30 minutes contains a horizontal line segment, indicating a period in which there was no change in the target heart rate. Choice C is incorrect because the graph over the interval between 50 and 65 minutes consists of a line segment with a negative slope followed by a line segment with a positive slope, indicating that the target heart rate is strictly decreasing then strictly increasing. Choice D is incorrect because the graph over the interval between 70 and 90 minutes contains horizontal line segments and no segment with a negative slope.