1.2 Functions and Their Properties

Symmetry, End Behavior of Functions

Target 1A: Analyze functions using specific properties

Review of Prior Concepts

Which of the letters of the alphabet have vertical symmetry? (Hint: A is one of them)

Which have 180° rotational symmetry?

A B C D E F
G H I J K L
M N O P Q
R S T U V
W X Y Z

More Practice

Symmetry

http://gwydir.demon.co.uk/jo/symmetry/refsym.htm

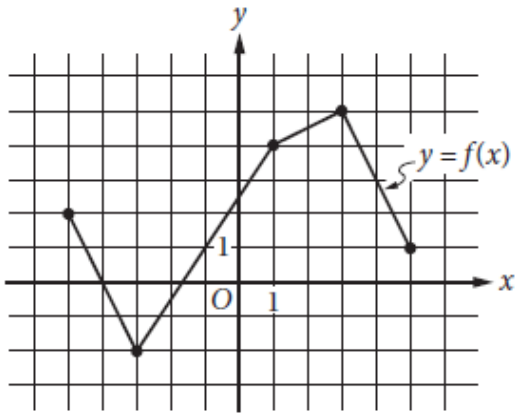
https://www.khanacademy.org/math/geometry/transformations/transformations-symmetry/v/example-rotating-polygons

SAT Connection

Passport to Advanced Math

13. Use function notation, and interpret statements using function notation.

Example:



The complete graph of the function f is shown in the xy-plane above. For what value of x is the value of $f(x)$ at its minimum?

A) -5

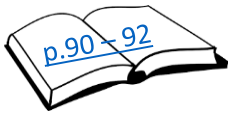
B) -3

C) -2

D) 3

Solution

Symmetry



- Even Functions – (graphically)

  – (numerically)

  – (algebraically)

- Odd Functions – (graphically)

  – (numerically)

  – (algebraically)

Determine graphically whether the function is even, odd, or neither. Check algebraically.

Example 1: $f(x) = 2x^4 + x^2 + 1$

Example 2: $g(x) = 2x^3 + x + 1$

Example 3: $h(x) = 2x^3 + x$

End Behavior

End Behavior – what happens at the ends of the function.

NOTATION:

Describe the end behavior of the function from the graph of the function.

Example 4: $f(x) = 2x^4 + x^2 + 1$

Example 5: $g(x) = 2x^3 + x + 1$

Example 6: $h(x) = \frac{x}{x^2+2}$

Example 7: $r(x) = \frac{x^3}{x^2+2}$

Example 8: $p(x) = \frac{x^2}{x^2+2}$

Horizontal Asymptotes – occur when end behavior approaches a #, c. H.A. is @ $y = c$.

NOTATION: $\lim_{x\to\infty} f(x) = c$ or $\lim_{x\to-\infty} f(x) = c$

More Practice

Symmetry

https://www.chilimath.com/algebra/intermediate/oef/even-and-odd-functions.html

https://www.youtube.com/watch?v=1LsJaR72UFM

End Behavior

http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/14-tail-behavior-limits-at-infinity-02

https://www.youtube.com/watch?v=Krjd_vU4Uvg

Homework Assignment

p.95 #35,38,39,45,49,50,51,53

SAT Connection

Solution

Choice B is correct. The minimum value of the function corresponds to the y-coordinate of the point on the graph that is the lowest along the vertical or y-axis. Since the grid lines are spaced 1 unit apart on each axis, the lowest point along the y-axis has coordinates $(-3, -2)$. Therefore, the value of x at the minimum of $f(x)$ is -3.

Choice A is incorrect; -5 is the smallest value for an x-coordinate of a point on the graph of f, not the lowest point on the graph of f. Choice C is incorrect; it is the minimum value of f, not the value of x that corresponds to the minimum of f. Choice D is incorrect; it is the value of x at the maximum value of f, not at the minimum value of f.