

## 4.2 Extrema, Symmetry, Etc.

1. Inc:  $(-\infty, \infty)$   
Dec: none  
Constant: none
2. Inc:  $(0, \infty)$   
Dec: none  
Constant: none
3. Inc:  $(-\infty, -3) \cup (-3, \infty)$   
Dec: none  
Constant: none
4. Inc:  $(4, \infty)$   
Dec:  $(-\infty, -1)$   
Constant:  $(-1, 4)$
5. Inc: none  
Dec:  $(-\infty, -2) \cup (3, \infty)$   
Constant:  $(-2, 3)$
6. Inc: none  
Dec:  $(-\infty, 1) \cup (1, \infty)$   
Constant: none
7.  $f(x) = 5x^3 + 2x$   
 $f(-x) = 5(-x)^3 + 2(-x)$   
 $f(-x) = -5x^3 - 2x$
8.  $f(x) = |x| - 3$   
 $f(-x) = |-x| - 3 = |x| - 3$   
 $f(-x) = f(x)$   
 $f(x)$  is even
9.  $f(x) = 3x^4 + 2x^2 - 5$   
 $f(-x) = 3(-x)^4 + 2(-x)^2 - 5$   
 $f(-x) = 3x^4 + 2x^2 - 5$   
 $f(-x) = f(x)$   
 $f(x)$  is even
10.  $f(x) = 12$   
 $f(-x) = 12$   
 $f(x) = f(-x)$   
 $f(x)$  is even
11.  $f(x) = \frac{1}{x}$   $f(-x) = -\frac{1}{x} = -\frac{1}{x}$   
 $-f(x) = -\frac{1}{x}$   
 $f(-x) = -f(x)$   
 $f(x)$  is odd

12.  $f(x) = 3x^2 - 5x + 1$   
 $f(-x) = 3(-x)^2 - 5(-x) + 1$   
 $f(-x) = 3x^2 + 5x + 1$

$-f(x) = -(3x^2 - 5x + 1)$

$-f(x) = -3x^2 + 5x - 1$

$f(-x) \neq f(x)$   $f(-x) \neq -f(x)$

$f(x)$  is neither even nor odd

15. rel max  $(-3, -1)$

rel min  $(1, -4)$

abs max none

abs min none

16. rel max  $(0, 0)$

rel min  $(-2, 2)$

abs max none

abs min none

13.  $f(x) = \sqrt{x^2 + 4}$

$f(-x) = \sqrt{(-x)^2 + 4}$

$f(-x) = \sqrt{x^2 + 4}$

$f(-x) = f(x)$

$f(x)$  is even

17. rel max  $(0, 0)$

rel min  $(1, -1)$  and  $(-1, -1)$

abs max none

abs min  $(1, -1)$  and  $(-1, -1)$

14.  $f(x) = \sqrt[3]{x^3 - x}$

$f(-x) = \sqrt[3]{(-x)^3 - (-x)}$

$f(-x) = \sqrt[3]{-x^3 + x}$  ←

$-f(x) = -\sqrt[3]{x^3 - x}$

because the root is odd . . .

$-f(x) = -1 \cdot \sqrt[3]{x^3 - x}$

$-f(x) = \sqrt[3]{-1} \cdot \sqrt[3]{x^3 - x}$

$-f(x) = \sqrt[3]{-1(x^3 - x)}$

$-f(x) = \sqrt[3]{-x^3 + x}$

$-f(x) = f(-x)$

$f(x)$  is odd

18. rel max  $(0, -3)$

rel min  $(2, -7)$

abs max none

abs min none