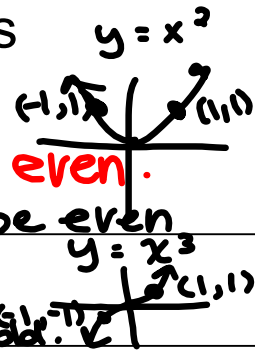


$5 = 5x^0$

Even and Odd Functions

Algebraically: Even, Odd, Neither?



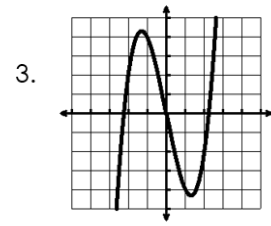
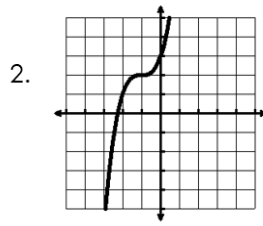
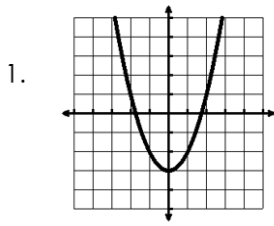
- ☆ A function is **even** if $f(-x) = f(x)$ **★ Constants are even.**
 - For polys, all terms must be even.
- ☆ A function is **odd** if $f(-x) = -f(x)$
 - For polys, all terms must be odd.
- ☆ A function is **neither** if
 - Combination of even and odd terms.

Graphically: Even, Odd, Neither?

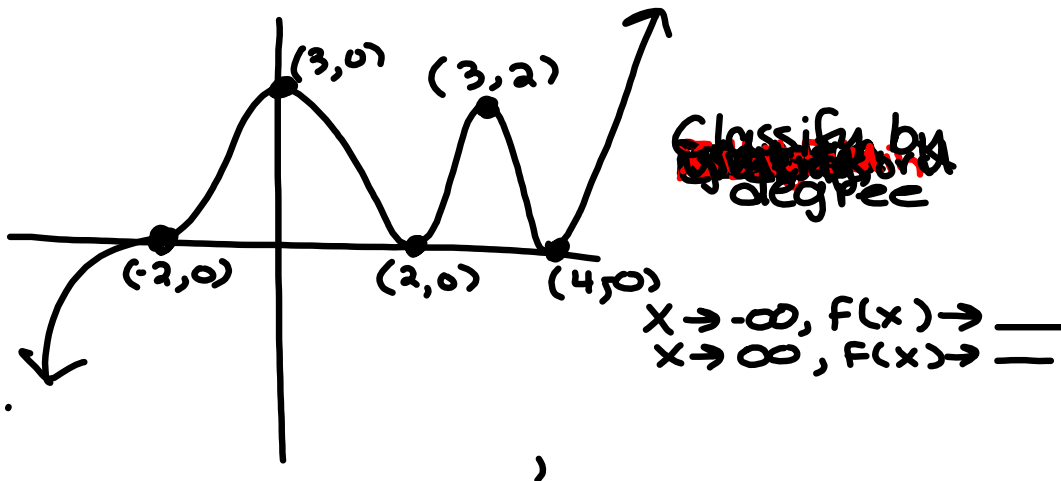
- ☆ A function is **even** if
 - it is symmetric over the y-axis.
- ☆ A function is **odd** if
 - it is symmetric over the origin

- 4) $f(x) = \underset{E}{x^2} + \underset{E}{1x^0}$ (E) **★ constants are even**
- 5) $f(x) = \underset{E}{2x^4} - \underset{E}{3x^0}$ (E)
- 6) $f(x) = \underset{O}{x^3} + \underset{O}{x^1}$ (O)

Tell whether the function is even, odd, or neither.



Warm Up: Use the picture to find the:

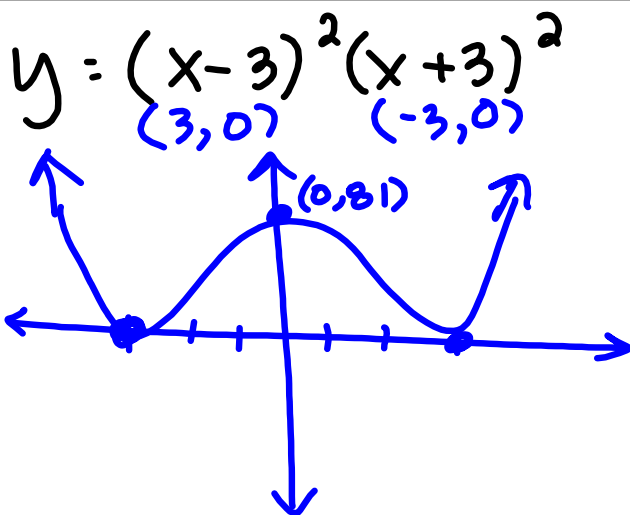


Warm Up: Use the picture to find the:

$$f(x) = -3x^4 + 5x^2 - 6$$

y int:

EB: $x \rightarrow -\infty, f(x) \rightarrow \underline{\quad}$
 $x \rightarrow \infty, f(x) \rightarrow \underline{\quad}$



y int:

x int:

EB

$x \rightarrow \infty, f(x) \rightarrow$

$x \rightarrow -\infty, f(x) \rightarrow$

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

y int:
f

x int:

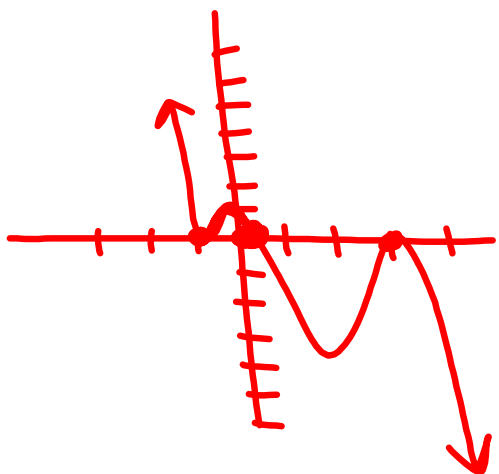
$$x-3=0$$

$$x+3=0$$

EB:

$$x \rightarrow -\infty, f(x) \rightarrow _$$

$$x \rightarrow \infty, f(x) \rightarrow _$$



What are:

1) The zeros

2) EB

3) Even, Odd or Ne

4) y int

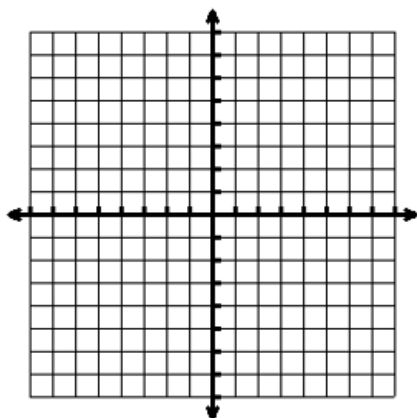
5) Least Degree

10. $f(x) = \frac{1}{2}x^4 + 9$

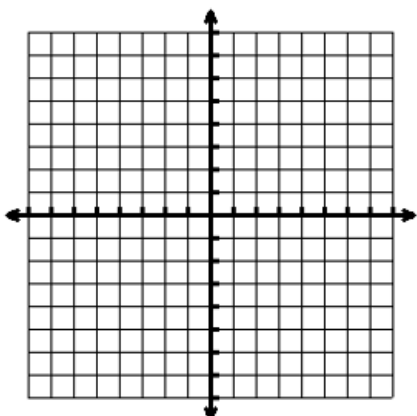
11. $f(x) = 5x + 1$

12. $f(x) = 5$

13. Can a linear function ever be even or odd? If so, sketch an example.

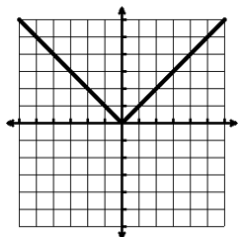


14. Can an exponential function ever be even or odd? If so, sketch an example.

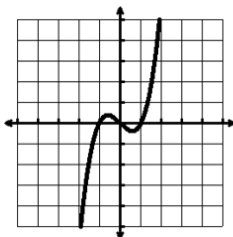


Examples: Even, Odd, Neither?

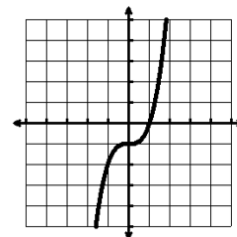
1. $f(x) = |x|$



2. $f(x) = x^3 - x$



3. $f(x) = x^3 - 1$



4. $f(x) = x^2 + 1$

5. $f(x) = 2x^4 - 3$

6. $f(x) = x^3 + x$

Factor:

1. $x^3 - 2x^2 - 9x + 18$

Factoring Polynomials

Apply the same factoring properties of quadratics multiple times to the same function.

Strategies include:

GCF

DOS

Break Apart

Grouping

Guess and Check

$$2. \quad 2x^3 - 8x^2 + 3x - 12$$

$$3. \quad 4x^3 + 16x^2 - x - 4$$

$$4. \quad x^4 - 16$$

$$5. \quad x^4 + 6x^2 + 8$$

$$6. \quad x^3 + 5x^2 - 4x - 20$$

$$7. \quad x^4 + 6x^2 + 5$$

$$8. \quad 21 - 7x + 3y - yx$$

$$9. \quad 2x^3 - x^2 - 10x + 5$$

$$10. 3x^2 + 12x + x + 4$$

$$11. x^4 + 5x^2 - 6$$

$$12. x^3 - 9x + 5x^2 - 45$$

$$13. x^4 - 81$$

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

$$f(x) = (x-2)^2(x+2)^2$$

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



Sum and Difference of Cubes

$$a^3 + b^3$$

$$a^3 - b^3$$

1.

2.

3.

$$f(x) = x^3 + 8$$

$$\begin{array}{r|rrrr} -2 & 1 & 0 & 0 & 8 \\ & \downarrow & -2 & 4 & -8 \\ \hline & 1 & -2 & 4 & 0 \end{array}$$

$$(x+2)(x^2 - 2x + 4)$$

$$\text{TOV:}$$

$$y = x^3 + 8$$

$$\text{x int:}$$

$$(-2, 0)$$

$$\downarrow$$

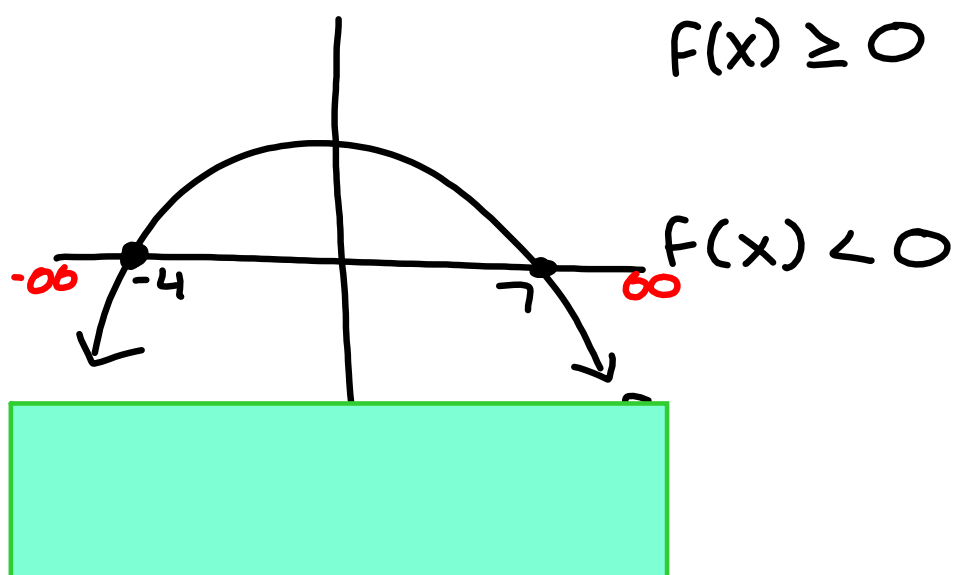
$$x = -2$$

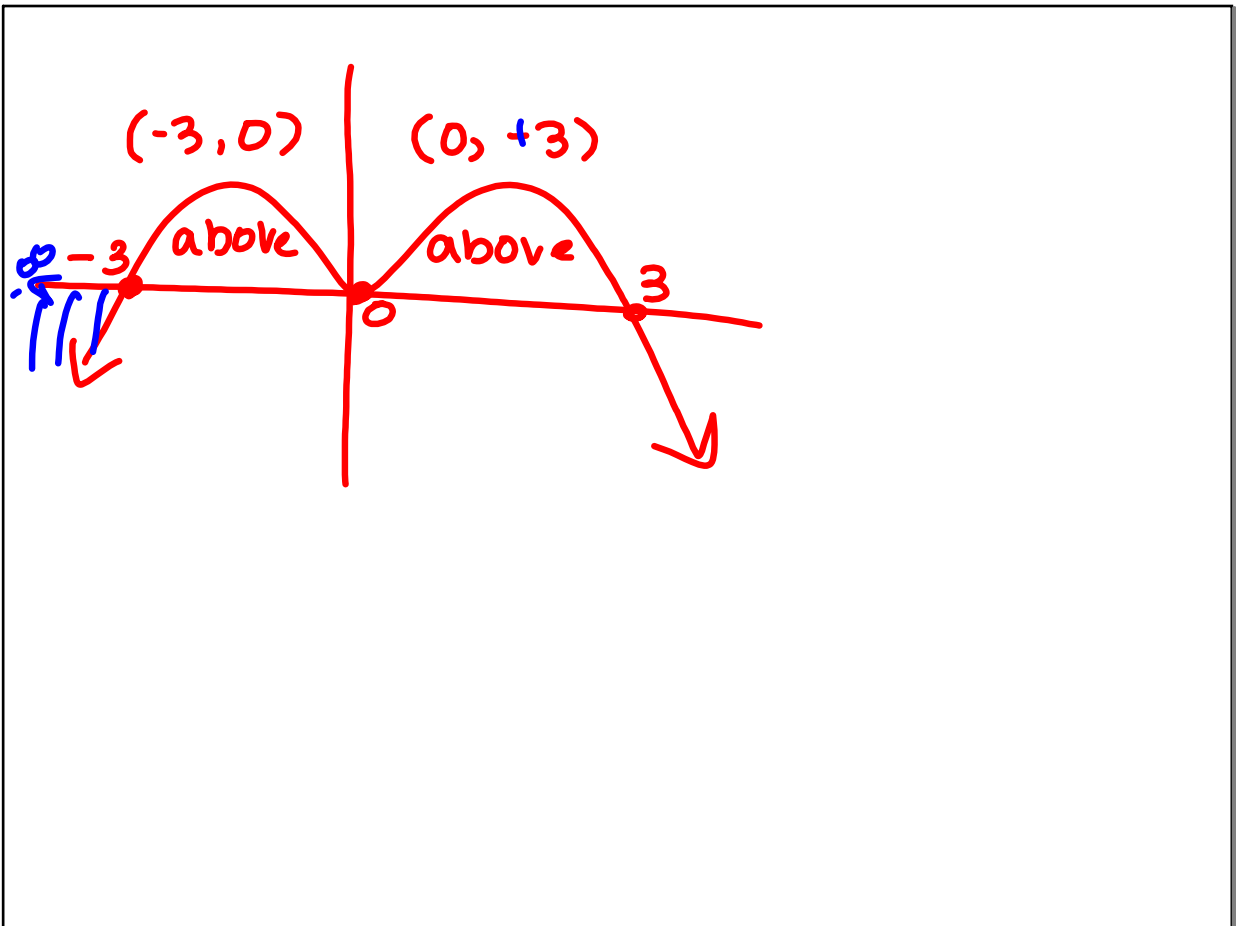
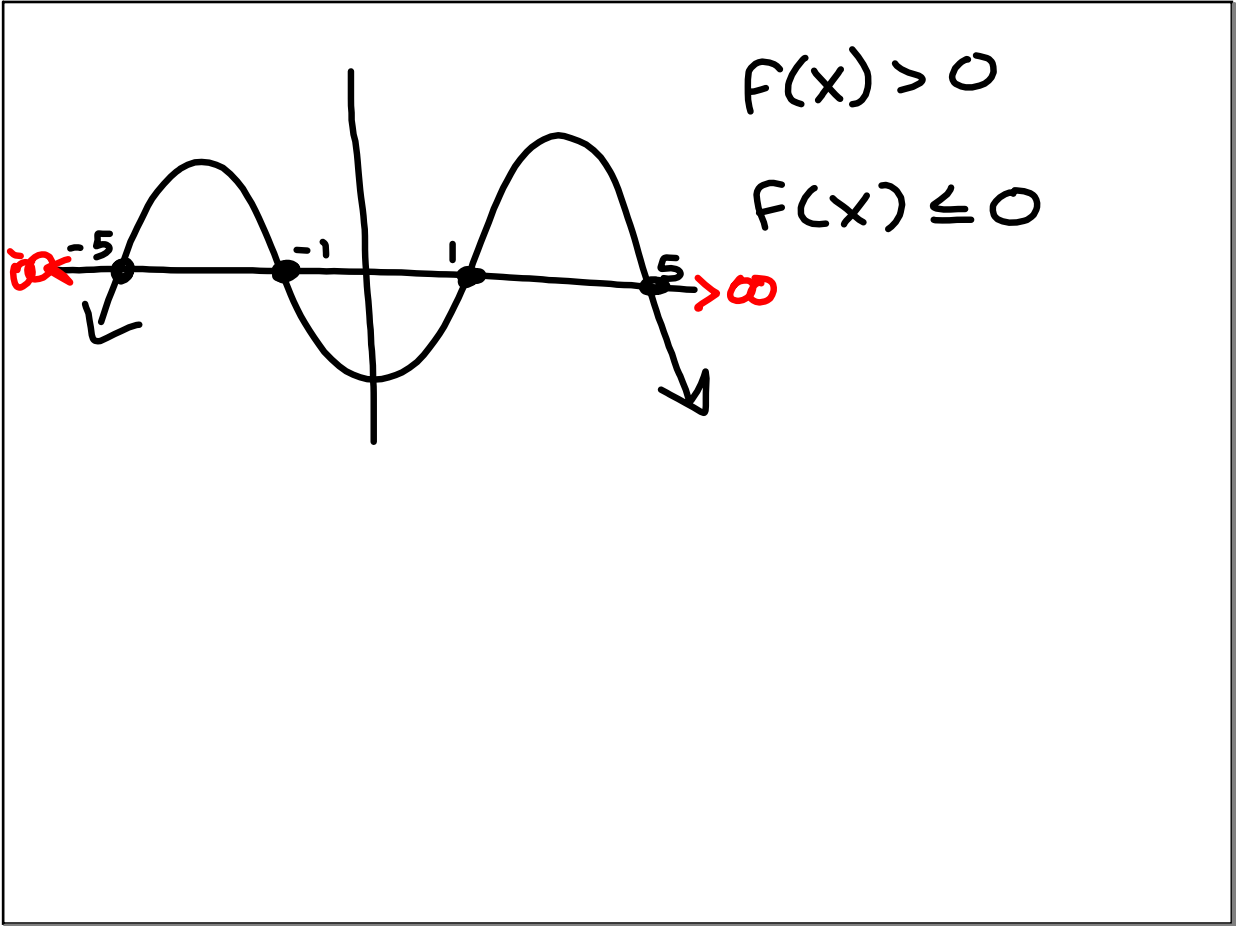
$$\underline{\underline{x+2=0}}$$

Sketch:

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

Where is the graph above the x-axis?





State whether the following is Even, Odd or Neither

1. $f(x) = 2x^4 - x^3 + 4x - 6$

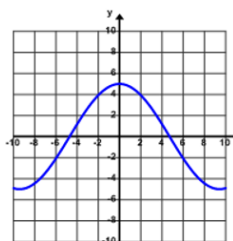
3. $h(x) = -2x^3 + 5x$

2. $f(x) = 8x^2 - 12$

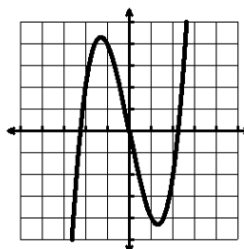
4. $f(x) = 7x^4 + 3x^2 - 4x$

State whether the following is Even, Odd or Neither

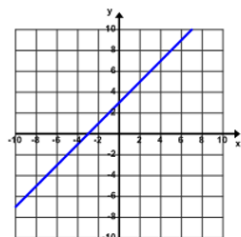
5.



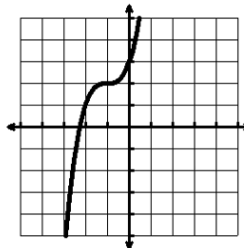
7.



6.



8.



Use the graph and find the following:

- 9. Domain: _____ 10. Range: _____
- 11. Intervals of Increasing: _____
- 12. Intervals of Decreasing: _____
- 13. Relative Maximums: _____
- 14. Relative Minimums: _____
- 15. # of Extrema: _____
- 16. Y-intercept _____
- 17. End Behavior As $x \rightarrow -\infty$, $f(x) \rightarrow$ _____
 As $x \rightarrow \infty$, $f(x) \rightarrow$ _____

