

9.1 Intercepts and Symmetry.

1. a) $y = 4x^2 - 9$

x-intercept:

$$0 = 4x^2 - 9$$

$$9 = 4x^2$$

$$\frac{9}{4} = x^2$$

$$\pm \frac{3}{2} = x$$

y-intercept

$$y = 4 \cdot 0^2 - 9$$

$$y = -9$$

b) $y = 3x^2 + 5x + 2$

x-intercept

$$y = 3x^2 + 3x + 2x + 2$$

$$0 = (x+1)(3x+2)$$

$$y = 3x(x+1) + 2(x+1)$$

$$x+1=0 \text{ or } 3x+2=0$$

$$y = (x+1)(3x+2)$$

$$x = -1 \quad 3x = -2$$

$$x = -\frac{2}{3}$$

y-intercept

$$y = (0+1)(3 \cdot 0 + 2)$$

$$y = (1)(2)$$

$$y = 2$$

c) $y = x^2 + x - 6$

x-intercept

$$y = (x+3)(x-2)$$

$$0 = (x+3)(x-2)$$

$$x+3=0 \text{ or } x-2=0$$

$$x = -3 \quad x = 2$$

y-intercept

$$y = (0+3)(0-2)$$

$$y = (3)(-2)$$

$$y = -6$$

d) $y = x^2 + x + 1$

x-intercept

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2 \cdot 1}$$

$$x = \frac{-1 \pm \sqrt{1-4}}{2}$$

$$x = \frac{-1 \pm \sqrt{-3}}{2}$$

no x-intercept because you can't do $\sqrt{-3}$

y-intercept

$$y = 0^2 + 0 + 1$$

$$y = 1$$

e) $y = 2x^3 - 9x^2 - 18x$

x-intercept

$$y = x(2x^2 - 9x - 18)$$

$$0 = x(x-6)(2x+3)$$

$$y = x[2x^2 - 12x + 3x - 18]$$

$$x=0, \quad x-6=0, \quad 2x+3=0$$

$$y = x[2x(x-6) + 3(x-6)]$$

$$x=6 \quad 2x = -3$$

$$y = x(x-6)(2x+3)$$

$$x = -\frac{3}{2}$$

y-intercept

$$y = 0(0-6)(2 \cdot 0 + 3)$$

$$y = 0(0)(0)$$

$$y = 0$$

9.1 Intercepts and Symmetry

1. f) $y = x^3 - 8$

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

x-intercept

$$0 = (x-2)(x^2+2x+4)$$

$$x = 2 \text{ or}$$

$$x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot 4}}{2 \cdot 1}$$

$$x = \frac{-2 \pm \sqrt{4 - 16}}{2}$$

$$x = \frac{-2 \pm \sqrt{-12}}{2}$$

$$x = 2$$

y-intercept

$$y = (0-2)(0^2+2 \cdot 0+4)$$

$$y = (-2)(4)$$

$$y = -8$$

2. a) odd - rotational symmetry
 b) even - reflection symmetry
 c) neither - no symmetry
 d) odd - rotational symmetry

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

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

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

even

b) $f(x) = x^3$

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

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

odd

c) $g(x) = x^2 + x^3$

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

$$= x^2 - x^3$$

neither

d) $g(x) = \frac{2}{x^4+1}$

$$g(-x) = \frac{2}{(-x)^4+1}$$

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

even

9.) Intercepts and Symmetry

3. e) $h(x) = (x+x^5)^3$
 $h(-x) = [-x + (-x)^5]^3$

$= (-x - x^5)^3$

$= [-(x+x^5)]^3$

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

odd

because

it's cubed \rightarrow

f) $h(x) = x^6(1+x-x^2)$

$h(-x) = (-x)^6 [1+(-x) - (-x)^2]$

$= x^6(1-x-x^2)$

neither

g) $y = |x|$
 $= x$

$y = |-x|$
 $= x$

even

h) $y = \frac{x^3}{x^4 + x^2 + 1}$

$y = \frac{(-x)^3}{(-x)^4 + (-x)^2 + 1}$

$= \frac{-x^3}{x^4 + x^2 + 1} = -f(x)$

odd