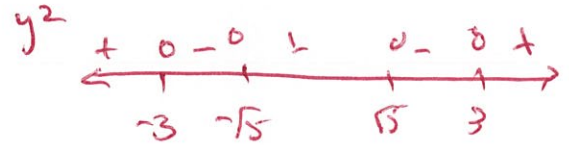


1. Find the zeros, domain, and End Behavior $y = \sqrt{x^4 - 14x^2 + 45}$ on $x \in [-4, 5]$

$$(x^2 - 5)(x^2 - 9)$$

zeros $(\pm 3, 0)$ $(\pm \sqrt{5}, 0)$

domain $x \in [-4, -3] \cup [-\sqrt{5}, \sqrt{5}] \cup [3, 5]$



Left End Behavior ~~UP~~ NONE

Right End Behavior ~~DOWN~~ NONE

2. Extreme points of $y = \sqrt{x^4 - 14x^2 + 45}$ on $x \in [-4, 5]$

$$\frac{dy}{dx} = \frac{2x^3 - 14x}{(x^4 - 14x^2 + 45)^{1/2}}$$

i) $x = 0$; ~~$\pm \sqrt{7/2}$~~ $(0, \sqrt{45})$

ii) $x = \pm 3, \pm \sqrt{5}$ $(\pm 3, 0), (\pm \sqrt{5}, 0)$

iii) $x = -4, 5$ $(-4, 8.775)$ $(5, 17.889)$

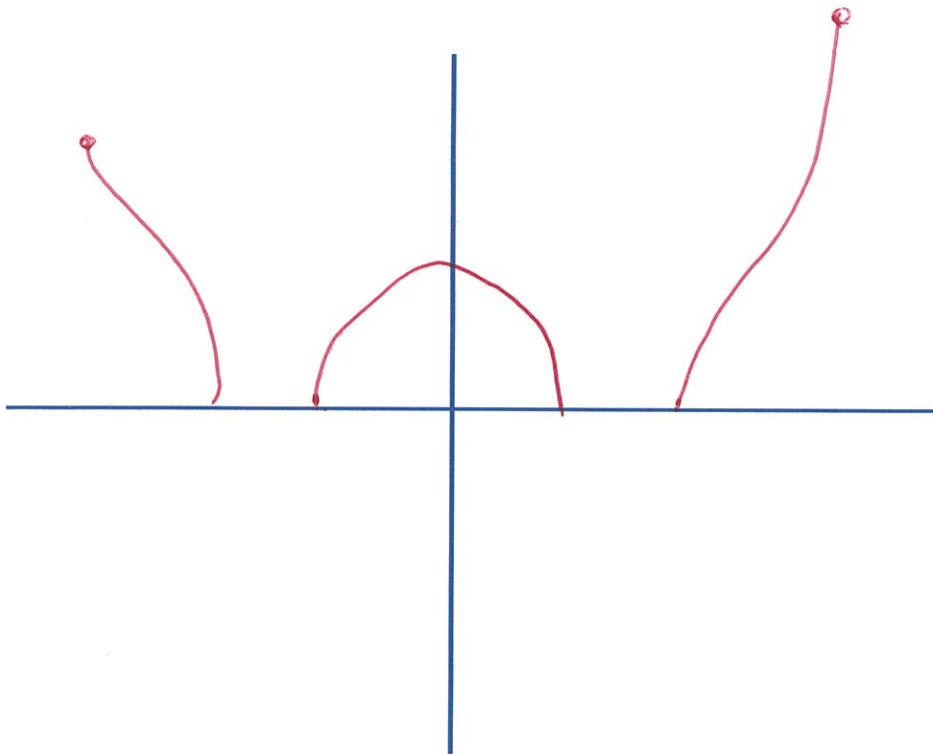
3. Find the traits and **sketch** of $y = \sqrt{x^4 - 14x^2 + 45}$ on $x \in [-4, 5]$.

Domain: SEE \#1

Range: $y \in [0, 17.889]$

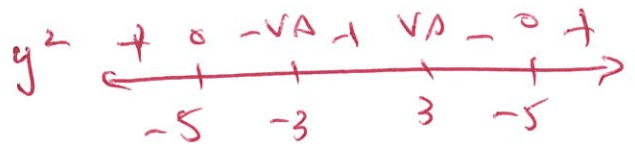
Y-Int: $(0, \sqrt{45})$

Zeros: SEE \#1



4. Find the zeros, domain, and End Behavior $y = -\sqrt{\frac{x^2-25}{x^2-9}}$.

zeros $(\pm 5, 0)$



domain $(-\infty, -5] \cup (-3, 3) \cup [5, \infty)$

Left End Behavior Down

Right End Behavior Down

5. Extreme points of $y = -\sqrt{\frac{x^2-25}{x^2-9}}$.

$$\frac{dy}{dx} = -\frac{1}{2} \left(\frac{x^2-25}{x^2-9} \right)^{-1/2} \left[\frac{(x^2-9)(2x) - (x^2-25)(2x)}{(x^2-9)^2} \right]$$

$$= \frac{-8x}{(x^2-25)^{1/2} (x^2-9)^{3/2}}$$

i) $\frac{dy}{dx} = 0 \rightarrow x = 0 \quad (0, -5/3)$

ii) $\frac{dy}{dx} = \text{DNE} \rightarrow x = \pm 5 \quad (\pm 5, 0)$

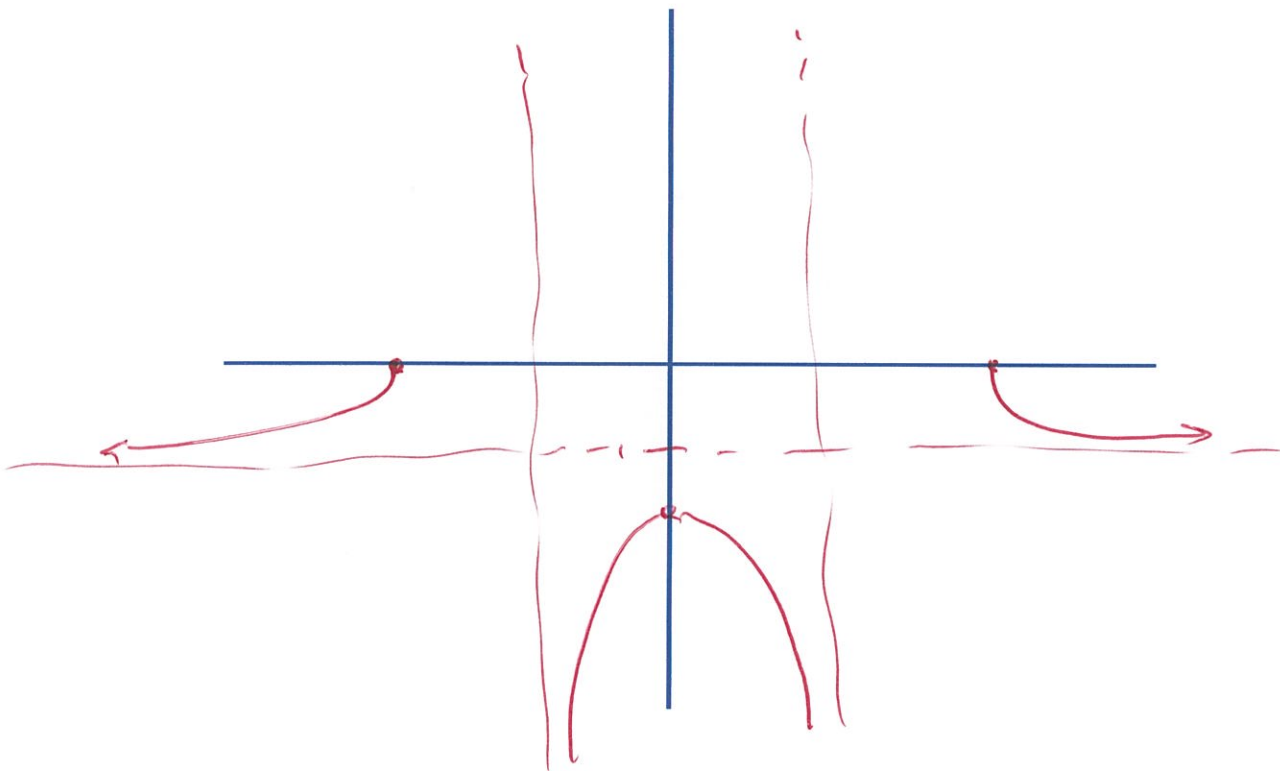
6. Find the traits and **sketch** of $y = -\sqrt{\frac{x^2 - 25}{x^2 - 9}}$.

Domain: SEE #4

Range: $y \in (-\infty, -\frac{5}{3}] \cup (1, 0]$

Y-Int: $(0, -\frac{5}{3})$

Zeros: SEE #4



1. Find the zeros, domain, and End Behavior $y = -\sqrt{x^3 - x^2 - 5x + 5}$ on $x \in [-6, 6]$

$$x^2(x-1) - 5(x-1)$$

zeros $(\pm\sqrt{5}, 0)$ $(1, 0)$

domain $[-\sqrt{5}, 1] \cup [1, 6]$



Left End Behavior NONE

Right End Behavior NONE

2. Extreme points of $y = -\sqrt{x^3 - x^2 - 5x + 5}$ on $x \in [-6, 6]$

$$\frac{dy}{dx} = -\frac{3x^2 - 2x - 5}{2(x^3 - x^2 - 5x + 5)^{1/2}}$$

i) $3x^2 - 2x - 5 = 0 \rightarrow x = \frac{2 \pm \sqrt{4 + 60}}{6} = \frac{2 \pm 8}{6}$
 ~~$x = \frac{2 + 8}{6} = 2$~~ , -1

$(-1, -2.828)$

ii) $x^3 - x^2 - 5x + 5 = 0 \rightarrow x = \pm\sqrt{5}, 1$

$(\pm\sqrt{5}, 0)$ $(1, 0)$

iii) $x = -\frac{6}{1} = -6$

$(6, -12.450)$

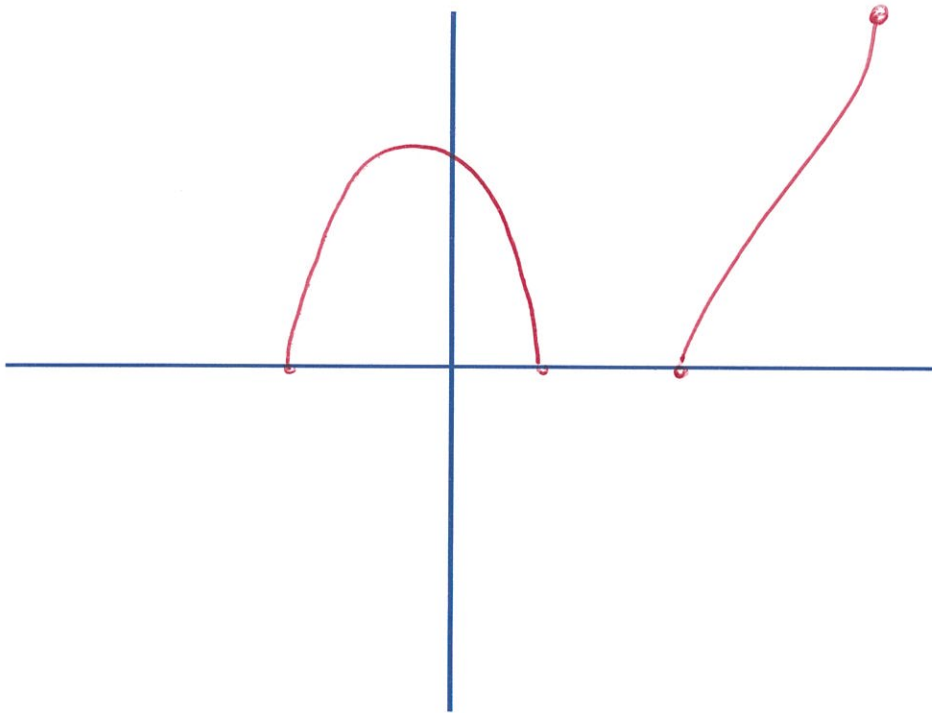
3. Find the traits and **sketch** of $y = -\sqrt{x^3 - x^2 - 5x + 5}$ on $x \in [-6, 6]$

Domain: see \#1

Range: $y \in [0, 12.450]$

Y-Int: $0, \sqrt{5}$

Zeros: see \#1



4. Find the zeros, domain, and End Behavior $y = \sqrt{\frac{x^2-9}{x^2-16}}$.

zeros $(\pm 3, 0)$

domain $x \in (-\infty, -4) \cup [-3, 3] \cup (4, \infty)$

Left End Behavior $y = 1$

Right End Behavior $y = 1$

5. Extreme points of $y = \sqrt{\frac{x^2-9}{x^2-16}}$.

$$\frac{dy}{dx} = \frac{1}{2} \left(\frac{x^2-16}{x^2-9} \right)^{1/2} \left[\frac{(x^2-16)(2x) - (x^2-9)(2x)}{(x^2-16)^{3/2}} \right] = \frac{-7x}{(x^2-16)^{3/2}(x^2-9)^{1/2}}$$

i) $\frac{dy}{dx} = 0 \rightarrow x = 0 \quad (0, \frac{3}{4})$

ii) $\frac{dy}{dx} \cdot DNE \rightarrow x = \pm 3, \pm 4 \quad (\pm 3, 0)$

iii) NONE GIVEN

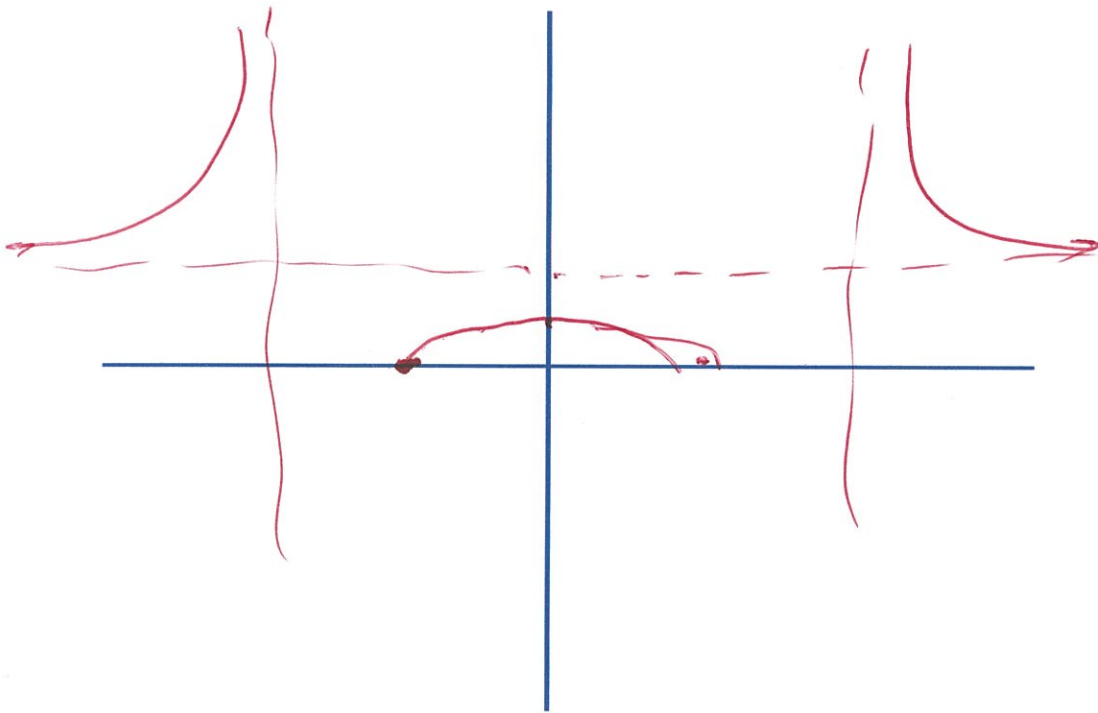
6. Find the traits and **sketch** of $y = \sqrt{\frac{x^2 - 9}{x^2 - 16}}$.

Domain: SEE #4

Range: $y \in [0, 3/4] \cup (1, \infty)$

Y-Int: $(0, 3/4)$

Zeros: SEE #4



1. Find the zeros, domain, and End Behavior $y = -\sqrt{-x^3 + 16x}$.

zeros $(\pm 4, 0)$ $(0, 0)$
 domain $(-\infty, -4] \cup [0, 4]$

$$-x(x^2 - 16)$$

y^2	*	0	-	0	+	0	-
←----- ----- ----- ----- ----->							
x		-4		0		4	

Left End Behavior UP

Right End Behavior NONE

2. Extreme points of $y = -\sqrt{-x^3 + 16x}$.

$$\frac{dy}{dx} = -\frac{1}{2}(-x^3 + 16x)^{-1/2} (-3x^2 + 16) = \frac{3x^2 - 16}{2(-x^3 + 16x)^{1/2}}$$

i) $\frac{dy}{dx} = 0 \Rightarrow x = \pm \frac{4}{\sqrt{3}}$ BUT $-\frac{4}{\sqrt{3}}$ NOT IN DOMAIN

ii) $-x^3 + 16x = 0 \Rightarrow x = \pm 4, 0$

$(0, 0)$ $(\pm 4, 0)$

iii) ENDPOINTS: NONE

$(\frac{4}{\sqrt{3}}, -4.962)$

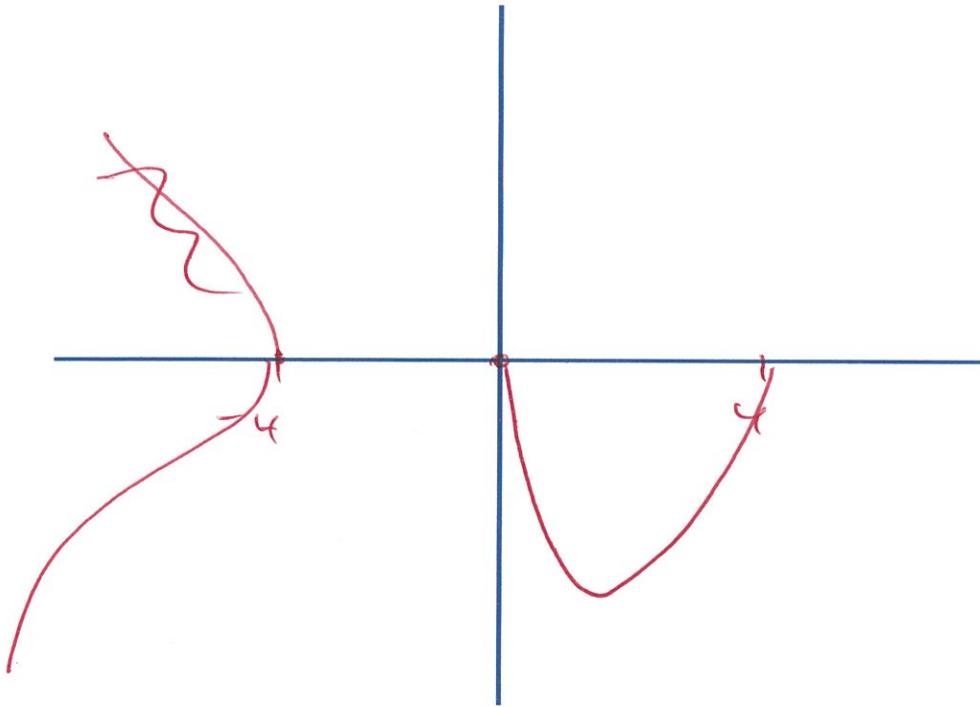
3. Find the traits and sketch of $y = -\sqrt{-x^3 + 16x}$.

Domain: $[-4, 4]$

Range: $y \in [-4, 0]$

Y-Int: $(0, 0)$

Zeros: $[-4, 0, 4]$



4. Find the zeros, domain, and End Behavior $y = \sqrt{\frac{-9x}{x^2+16}}$ on $x \geq -5$.

zeros $(0, 0)$
 ~~$x \in [-5, 0]$~~

domain $x \in [-5, 0]$

Left End Behavior NONE

Right End Behavior NONE

5. Extreme points of $y = \sqrt{\frac{-9x}{x^2+16}}$ on $x \geq -5$.

$$\frac{dy}{dx} = \frac{1}{2} \left(\frac{-9x}{x^2+16} \right)^{-1/2} \left[\frac{(x^2+16)(-9) - (-9x)(2x)}{(x^2+16)^2} \right] = \frac{9x^2 - 144}{2(-9x)^{1/2}(x^2+16)^{3/2}}$$

i) $\frac{dy}{dx} = 0 \Rightarrow x = \pm 4 \rightarrow x = -4 \quad (-4, 1.0661)$

ii) $\frac{dy}{dx} \text{ DNE} \Rightarrow x = 0, \quad (0, 0)$

iii) END POINTS $x = -5 \quad (-5, 1.047)$

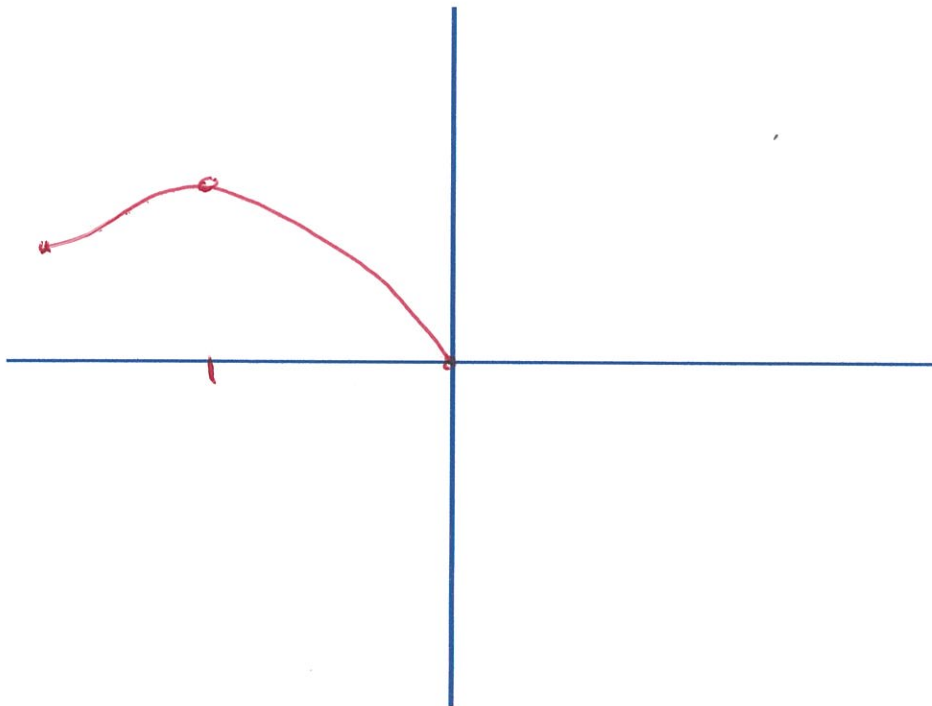
6. Find the traits and sketch of $y = \sqrt{\frac{-9x}{x^2+16}}$ on $x \geq -5$.

Domain: $x \in [-5, 0]$

Range: $y \in [0, 1.061]$

Y-Int: $(0, 0)$

Zeros: $x = -5$



1. Find the zeros, domain, and End Behavior $y = \sqrt{-x^4 + 10x^2 - 9}$.

zeros $(\pm 3, 0) \pm 1, 0)$

domain $x \in [-3, -1] \cup [1, 3]$

$$-(x^2-9)(x^2-1)$$

$$\begin{array}{ccccccc} - & + & - & + & - & + & - \\ < & | & & | & & | & | & > \\ & -3 & & -1 & & 1 & & 3 \end{array}$$

Left End Behavior NONE

Right End Behavior NONE

2. Extreme points of $y = \sqrt{-x^4 + 10x^2 - 9}$.

$$\frac{dy}{dx} = \frac{-4x^3 + 20x}{2(-x^4 + 10x^2 - 9)^{1/2}} = \frac{-2x(x^2 - 5)}{2(-x^4 + 10x^2 - 9)^{1/2}}$$

i) $x = \pm \sqrt{5/2}$

$(\pm \sqrt{5}, 4)$
 $(\pm \sqrt{5/2}, 3.122)$

ii) $x = \pm 3, \pm 1$

$(\pm 1, 0) (\pm 3, 0)$

iii) NO END POINTS GIVEN

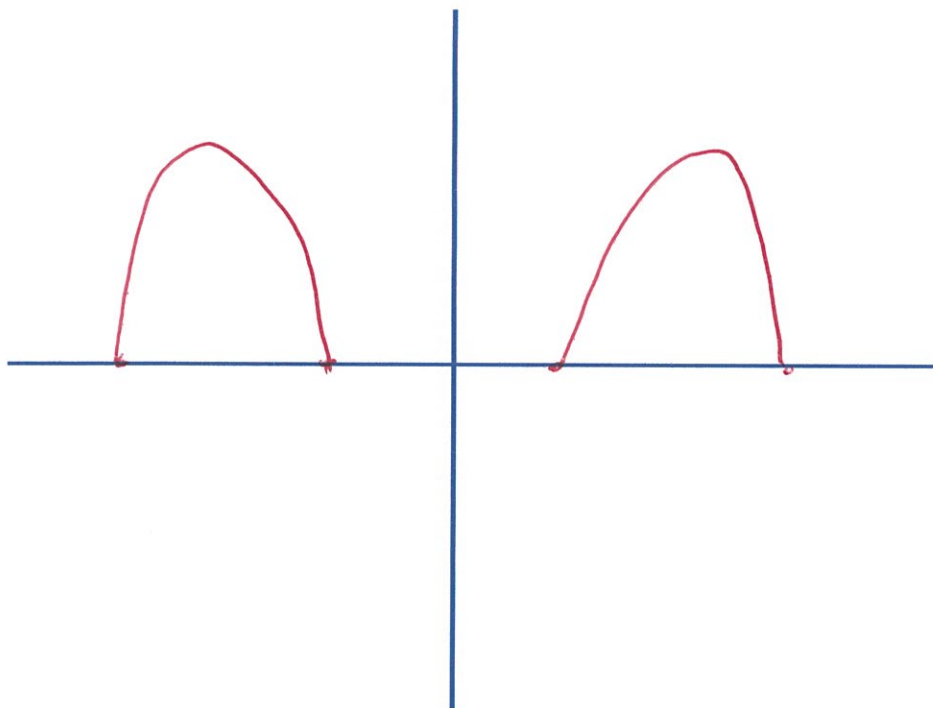
3. Find the traits and **sketch** of $y = \sqrt{-x^4 + 9x^2 - 9}$.

Domain: *SEE #1*

Range: $y \in [0, 3.122]$

Y-Int: *NONE*

Zeros: *SEE #1*



4. Find the zeros, domain, and End Behavior $y = \sqrt{\frac{4x}{x^2+9}}$

zeros $(0, 0)$

domain $x \in [0, \infty)$

Left End Behavior NONE

Right End Behavior $y = 0$

5. Extreme points of $y = \sqrt{\frac{4x}{x^2+9}}$.

$$\frac{dy}{dx} = \frac{1}{2} \left(\frac{4x}{x^2+9} \right)^{-1/2} \left[\frac{(x^2+9)(4) - 4x(2x)}{(x^2+9)^2} \right] = \frac{-2x^2 + 18}{(4x)^{1/2} (x^2+9)^{3/2}}$$

i) $x = \pm 3$ but only 3 is in domain $(3, \sqrt{2/3})$

ii) $x = 0$ $(0, 0)$

iii) NO EXTREME POINTS GIVEN

6. Find the traits and sketch of $y = \sqrt{\frac{4x}{x^2+9}}$.

Domain: $\mathbb{R}_{\geq 0}$

Range: $y \in [0, \frac{2}{3}]$

Y-Int: $(0, 0)$

Zeros: $\mathbb{R}_{\geq 0}$

