Graphing Radical Functions Using Critical Values

One way to graph radical functions is using the method of critical values and critical points.

Example 1: Graph $f(x) = \sqrt{x-7} + 2$

First: The critical values for roots occur where the argument equals 0.

$$x - 7 = 0$$
$$x = 7$$

Second: Determine the critical point.

Substitute the critical value into the function.

$$f(7) = \sqrt{7-7} + 2$$
$$= 2$$

This will give you the critical point: (7,2)

Third: Graph this point.

Fourth: Use sample to determine the behavior to the left and right of this point.

$f(8) = 3$

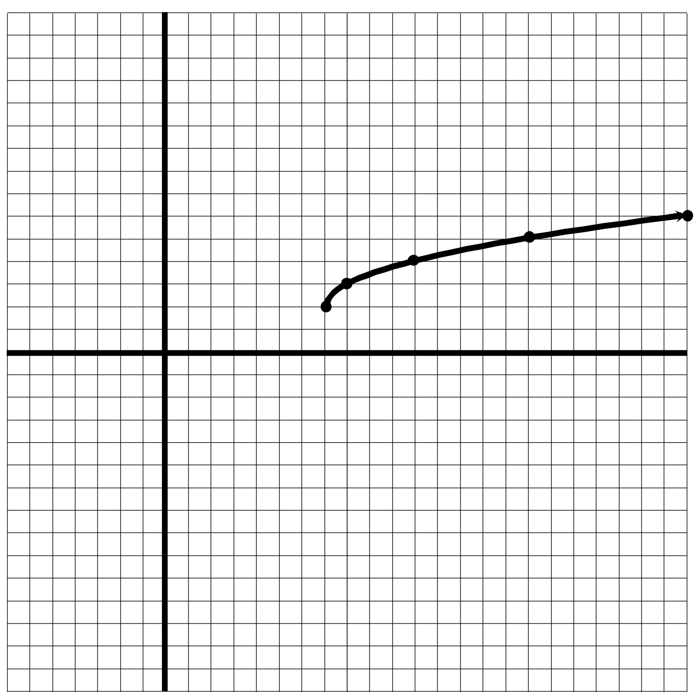
$f(11) = 4$

$f(16) = 5$

$f(6)$ is undefined

You now know the function is undefined to the left of (7,2) and is rising slower and slower to the right of (7,2).

Fifth: Draw the suggested graph.



Example 2: Graph $g(x)=\sqrt{16-x^2}-x+1$

First: Find the critical values.

$$16-x^2=0$$
$$-x^2=-16$$
$$x^2=16$$
$$x=\pm\sqrt{16}$$
$$x=4,-4$$

Second: Find the critical points.

$$g(4)=-3$$
$$g(-4)=5$$

The critical points are (4,–3) and (–4,5)

Third: Graph the critical points.

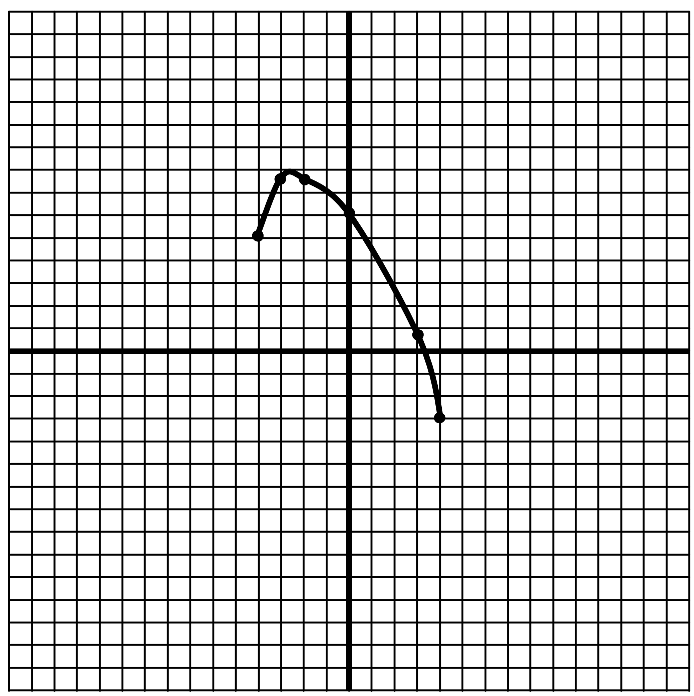
Fourth: Sample in each region.

$g(5)$ is undefined.

$$g(3)=\sqrt{7}-3+1\approx 0.6$$
$$g(0)=5$$
$$g(-2)=\sqrt{12}-(-2)+1\approx 6.5$$
$$g(-3)=\sqrt{7}-(-3)+1\approx 6.6$$

$g(-5)$ is undefined.

Fifth: Draw the suggested graph.



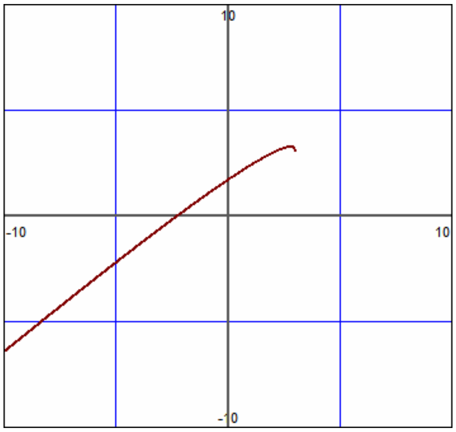
Problem Set

Graph the following functions:

1. $f(x)=\sqrt{3-x}+x$
2. $g(x)=-\sqrt{3x+6}+5$
3. $h(x)=\sqrt{x^2-5x}$
4. $f(x)=\sqrt{2x^2-50}-2$
5. $g(x)=\sqrt{x^2-6x+8}$
6. $h(x)=\sqrt{49-x^2}+2$
7. $f(x)=\sqrt{x^3-4x}$
8. $g(x)=\sqrt[3]{x-3}$

Answers:

1.



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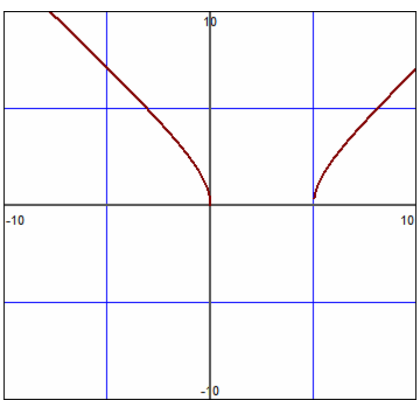

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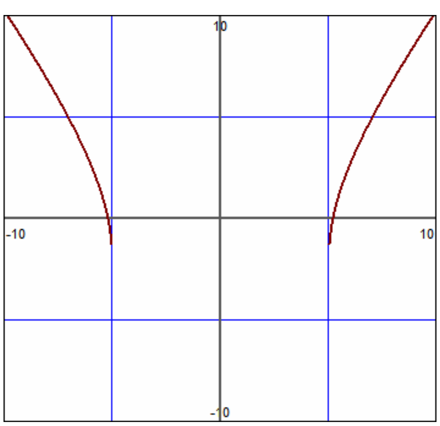

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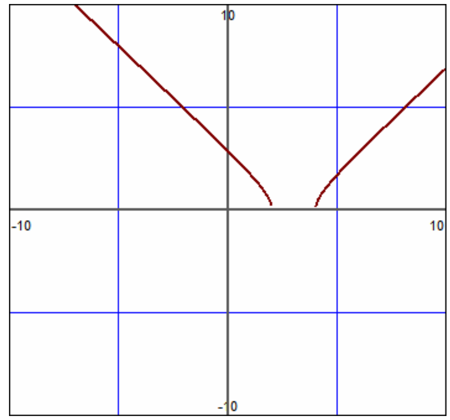

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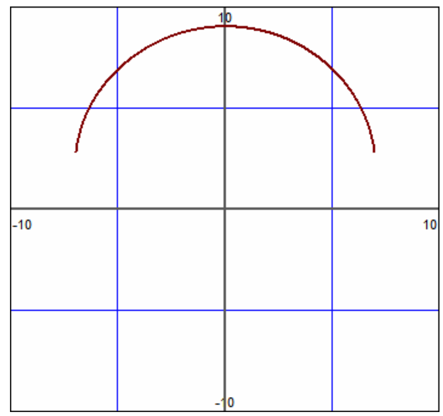

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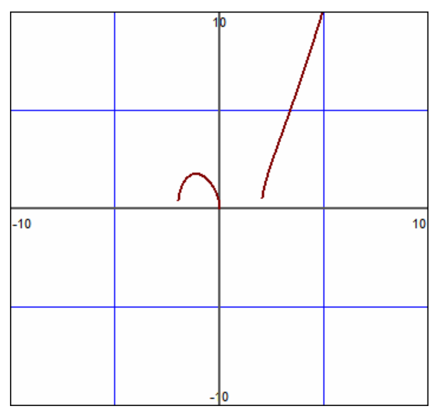

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