

Skills Preview


## Lesson Objectives

- Given the graph of a function $y=f(x)$, be able to graph the transformed function $y=a f(b(x+c))+d$
- Provide a complete analysis of the following types of graphs: quadratic, root, cubic, reciprocal, exponential
- Given the equation of $y=f(x)$, be able to determine the new equation, new domain, and sketch the transformed function $y=a f(b(c+x))+d$

|  |  | Parent Func | ions |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Base <br> Function | Features | Example |  |
|  | $f(x)=x^{2}$ | Vertex \& axis of symmetry, pts ( $\pm 2,4$ ) | $\mathrm{f}(\mathrm{x})=2 \mathrm{x}^{2}+6 \mathrm{x}-5$ |  |
|  | $\mathrm{f}(\mathrm{x})={ }^{\text {x }}$ | "vertex", pts of (4,2) | $\mathrm{f}(\mathrm{x})=-\sqrt{ }(3-\mathrm{x})$ |  |
|  | $\mathrm{f}(\mathrm{x})=\mathrm{x}^{3}$ | Max \& mins | $\mathrm{f}(\mathrm{x})=\mathrm{x}^{3}-12 \mathrm{x}$ |  |
|  | $\mathrm{f}(\mathrm{x})=1 / \mathrm{x}$ | Asymptotes and pts ( 1,1 ) and ( $-1,-1$ ) | $f(\mathrm{x})=3-1 /(\mathrm{x}+2)$ |  |
|  | $f(\mathrm{x})=\|\mathrm{x}\|$ | "vertex" and ( $\pm 1,1$ ) | $f(\mathrm{x})=2\|\mathrm{x}-3\|$ |  |
|  | $\mathrm{f}(\mathrm{x})=2^{\mathrm{x}}$ | Asymptote, pt ( 0,1 ) | $f(\mathrm{x})=-2^{\text {x-4 }}+3$ |  |
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(A) Working with Parabolas

- The key features of a parabola that will be helpful in studying transformations $\rightarrow$ you should already know the vertex and the axis of symmetry as well as being able to work with any key order pairs (i.e. $(1,1)$ or $(2,4))$
- And since the vertex is a key point, you should be able to connect the vertex form and the process of completing the square to identifying transformations of $y=x^{2}$.

(B) Working with Root Functions
- The key features of a "sideways" parabola or a root function that will be helpful in studying transformations $\rightarrow$ the
"vertex" as well as being able to work with any key order pairs (i.e. $(1,1)$ or $(4,2))$
- So work with the function $f(x)=-\sqrt{3-x}$
- PREDICT the transformations of $f(x)=V$ and sketch, labeling key points

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(B) Working with Root Functions


## (C) Working with Rational Functions

- The key features of a rational function that will be helpful in studying transformations $\rightarrow$ you should already know the asymptotes as well as being able to work with any key order pairs (i.e. $(1,1)$ or $(-1,-1))$
- So work with the function $f(x)=3-\frac{1}{x+2}$
- PREDICT the transformations of $f(x)=1 / x$
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## (C) Working with Rational Functions

- Working with $g(x)=1 / \mathrm{x}$ and $f(x)=3-\frac{1}{x+2}$
- (a) Explain how $f(x)$ must be transformed to get back to $g(x)$
- (b) Sketch $y=f(x)$, showing three key points on $f(x)$
- (c) Sketch $y=f^{-1}(x)$, showing key features of the inverse function
- (d) Graph $y=[1 / g(x)]^{2}$ on your TI-84 on the domain of $(-5,5]$ \& identify the range, max/mins, \& intercepts \& asymptotes
(12)

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(D) Working with Cubics $f(x)=x^{3}$

- The key features of a cubic function that will be helpful in studying transformations $\rightarrow$ you should know the maximums \& minimum (extrema, turning points) and roots as well as being able to work with any key order pairs (i.e. $(1,1)$ or $(-1,-1)$ )


(D) Working with Cubics $f(x)=x^{3}$
- If $f(x)=x^{3}-12 x$,
- (a) Show that $f(x)$ is an even function. Find zeroes \& sketch $f(x)$
- (b) Graph $g(x)=1 / 2 f(x-2)+4$
- (c) Determine the cubic equation for $y=g(x)$
- (d) Solve $\mathrm{g}(\mathrm{x})=0$
- (e) CA: Graph and analyze $y=\frac{g(x)}{x^{2}-4}$ on xER:
(find asymptotes, roots, intervals of increase/decrease)
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(D) Working with Cubics $f(x)=x^{3}$
- So if $f(x)=x^{3}-12 x$, then graph $g(x)=1 / 2 f(x-2)+4$


Key Features of $f(x)=2^{x}$

- The key features of an exponential function that will be helpful in studying transformations $\rightarrow$ you should know the asymptote and y -intercept as well as being able to work with any key order pairs $\rightarrow$ i.e. $(1,2)$ or $(-1,1 / 2)$ or $(2,4)$
- So work with the function $\mathrm{y}=-2^{\mathrm{x}-4}+3$
- PREDICT the transformations of $\mathrm{f}(\mathrm{x})=2^{\mathrm{x}}$



## Culminating Assessment

- Of course, you may have the skill set from your previous math studies to demonstrate the required skills \& concepts
- Complete the following calculator inactive "quiz"


## Q1

- Sketch the graph of $f(x)=1 / x$ and then sketch a graph of $g(x)=-2 f(3 x-6)+4$ and provide a complete functional analysis of $\mathrm{g}(\mathrm{x})$ (Domain, range, asymptotes, intercepts.)
- Evaluate $\mathrm{g}(19 / 9)$


## Q2

- Given the following graph of $\mathrm{h}(\mathrm{x})$, identify the transformations of $h(x)$ and then graph $\mathrm{k}(\mathrm{x})$ if $\mathrm{k}(\mathrm{x})$ is defined as follows:
- (a) $k(x)+2=-2 h(0.5(x+1))$
- (b) $4 \mathrm{k}(\mathrm{x})+8=\mathrm{h}(4-0.5 \mathrm{x})$
- Show a detailed "sample calculation" of how you transformed the point $A(2,1)$ onto its image point

- Evaluate k(-1)

