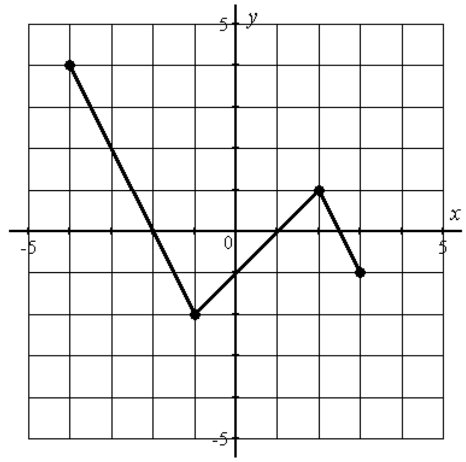
I can describe the graph behavior of any function given its graph; I can graph and analyze a variety of functions.

For each function, identify the domain, range, *x*- and *y*-intercepts, horizontal and vertical asymptotes, relative minimums and maximums, intervals of increase and decrease, and left and right end-behavior.

- *see graph at the right*
- $f(x) = x^3 - 3x^2 + 7$
- $f(x) = -\frac{1}{2}(x-6)^2$
- $f(x) = \frac{5}{x-3}$
- $f(x) = \frac{x^2+1}{x^2-1}$
- $f(x) = \frac{2}{3}(9)^x + 4$
- $f(x) = \left(\frac{1}{4}\right)^{x-2}$
- $f(x) = 5\log_2(-x)$
- $f(x) = \ln(x+8)$



I can use transformations to graph new functions; I can graph parent functions.

For each function, identify its parent function, describe any transformations, then sketch its graph.

- $f(x) = 2(x-1)^2$
- $f(x) = \frac{-1}{x} + 3$
- $f(x) = |2x| - 9$
- $f(x) = \frac{1}{2}(4)^{x+3}$
- $f(x) = \ln\left(-\frac{x}{2}\right)$

see graph

domain: $[-4, 3]$

range: $[-2, 4]$

x-intercept: $(-2, 0)$, $(1, 0)$, $(2.5, 0)$

y-intercept: $(0, -1)$

horizontal asymptote: *none*

vertical asymptote: *none*

relative minimum: $(-1, -2)$

relative maximum: $(2, 1)$

increasing interval: $(-1, 2)$

decreasing interval: $(-4, -1) \cup (2, 3)$

left end-behavior: *none*

right end-behavior: *none*

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

domain: $(-\infty, \infty)$

range: $(-\infty, \infty)$

x-intercept: $(-1.279, 0)$

y-intercept: $(0, 7)$

horizontal asymptote: *none*

vertical asymptote: *none*

relative minimum: $(2, 3)$

relative maximum: $(0, 7)$

increasing interval: $(-\infty, 0) \cup (2, \infty)$

decreasing interval: $(0, 2)$

left end-behavior: $x \to -\infty,\ f(x) \to -\infty$

right end-behavior: $x \to \infty,\ f(x) \to \infty$

$f(x) = -\frac{1}{2}(x-6)^2$

domain: $(-\infty, \infty)$

range: $(-\infty, 0]$

x-intercept: $(6, 0)$

y-intercept: $(0, -18)$

horizontal asymptote: *none*

vertical asymptote: *none*

relative minimum: *none*

relative maximum: $(6, 0)$

increasing interval: $(-\infty, 6)$

decreasing interval: $(6, \infty)$

left end-behavior: $x \to -\infty,\ f(x) \to -\infty$

right end-behavior: $x \to \infty,\ f(x) \to -\infty$

$f(x) = \frac{5}{x-3}$

domain: $(-\infty, 3) \cup (3, \infty)$

range: $(-\infty, 0) \cup (0, \infty)$

x-intercept: *none*

y-intercept: $(0, -5/3)$ or $(0, -1.667)$

horizontal asymptote: $y = 0$

vertical asymptote: $x = 3$

relative minimum: *none*

relative maximum: *none*

increasing interval: *none*

decreasing interval: $(-\infty, 3) \cup (3, \infty)$

left end-behavior: $x \to -\infty,\ f(x) \to 0$

right end-behavior: $x \to \infty,\ f(x) \to 0$

$f(x)=\dfrac{x^2+1}{x^2-1}$

domain: $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

range: $(-\infty, -1] \cup (1, \infty)$

x-intercept: *none*

y-intercept: $(0, -1)$

horizontal asymptote: $y = 1$

vertical asymptote: $x = -1$, $x = 1$

relative minimum: *none*

relative maximum: $(0, -1)$

increasing interval: $(-\infty, -1) \cup (-1, 0)$

decreasing interval: $(0, 1) \cup (1, \infty)$

left end-behavior: $x \to -\infty,\ f(x) \to 1$

right end-behavior: $x \to \infty,\ f(x) \to 1$

$f(x)=\dfrac{2}{3}(9)^x+4$

domain: $(-\infty, \infty)$

range: $(4, \infty)$

x-intercept: *none*

y-intercept: $(0, 14/3)$ or $(0, 4.667)$

horizontal asymptote: $y = 4$

vertical asymptote: *none*

relative minimum: *none*

relative maximum: *none*

increasing interval: $(-\infty, \infty)$

decreasing interval: *none*

left end-behavior: $x \to -\infty,\ f(x) \to 4$

right end-behavior: $x \to \infty,\ f(x) \to \infty$

$f(x)=\left(\dfrac{1}{4}\right)^{x-2}$

domain: $(-\infty, \infty)$

range: $(0, \infty)$

x-intercept: *none*

y-intercept: $(0, 16)$

horizontal asymptote: $y = 0$

vertical asymptote: *none*

relative minimum: *none*

relative maximum: *none*

increasing interval: *none*

decreasing interval: $(-\infty, \infty)$

left end-behavior: $x \to -\infty,\ f(x) \to \infty$

right end-behavior: $x \to \infty,\ f(x) \to 0$

$f(x)=5\log_2(-x)$

domain: $(-\infty, 0)$

range: $(-\infty, \infty)$

x-intercept: $(-1, 0)$

y-intercept: *none*

horizontal asymptote: *none*

vertical asymptote: $x = 0$

relative minimum: *none*

relative maximum: *none*

increasing interval: *none*

decreasing interval: $(-\infty, 0)$

left end-behavior: $x \to -\infty,\ f(x) \to \infty$

right end-behavior: *none*

$f(x) = \ln(x+8)$

domain: $(-8, \infty)$

range: $(-\infty, \infty)$

x-intercept: $(-7, 0)$

y-intercept: $(0, \ln 8)$ or $(0, 2.079)$

horizontal asymptote: *none*

vertical asymptote: $x = -8$

relative minimum: *none*

relative maximum: *none*

increasing interval: $(-8, 0)$

decreasing interval: *none*

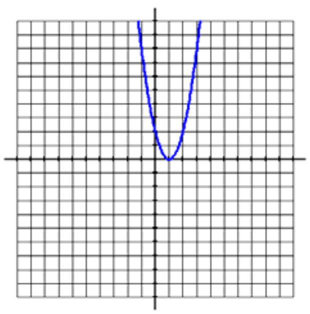
left end-behavior: *none*

right end-behavior: $x \to \infty,\ f(x) \to \infty$

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

parent: quadratic

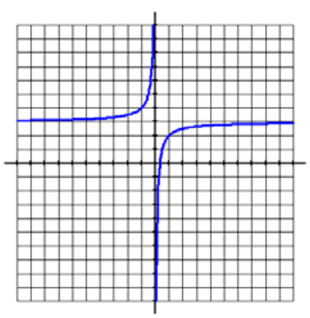
transformations: vertical stretch by a factor of 2, horizontal shift right 1



$f(x) = \dfrac{-1}{x} + 3$

parent: reciprocal

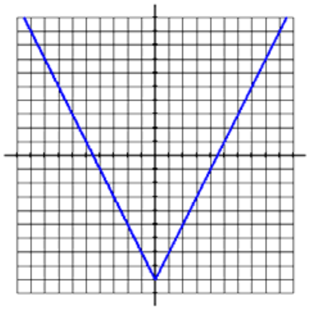
transformations: vertical flip over the x-axis, vertical shift up 3



$f(x) = |2x| - 9$

parent: absolute value

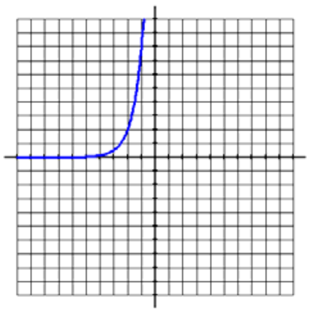
transformations: horizontal shrink by a factor of 2, vertical shift down 9



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

parent: exponential

transformations: vertical shrink by a factor of 2, horizontal shift left 3



$f(x) = \ln\left(-\frac{x}{2}\right)$

parent: logarithmic

transformations: horizontal flip over the y-axis, horizontal stretch by a factor of 2