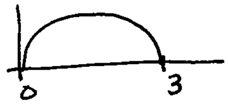
$y = \sqrt{3x - x^2}$

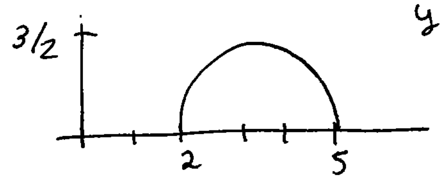
1.3 #6.

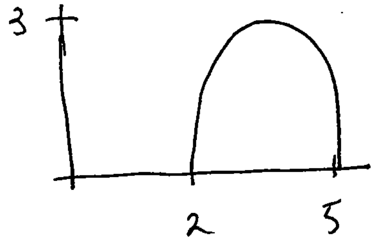


$y = \sqrt{3(x-3) - (x-3)^2} = \sqrt{(3-(x-3))(x-3)}$

$= \cancel{\sqrt{3x-9-x^2+6x-9}} = \sqrt{(6-x)(x-3)}$

$= \cancel{\sqrt{-x^2+9x-18}}$



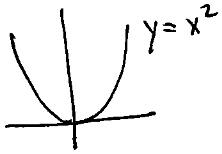


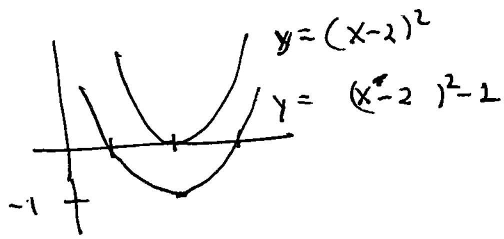
$y = 2\sqrt{(6-x)(x-3)}$

1.3 # 12.

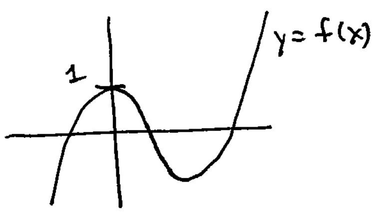
$y = x^2 - 4x + 3 = x^2 - 4x + 4 - 1$

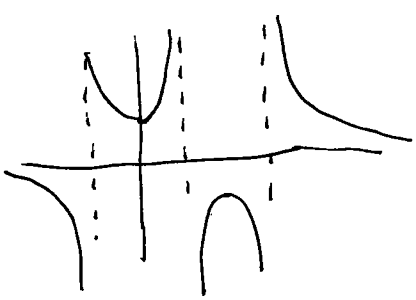
$= (x-2)^2 - 1$





1.3 # 28.





The important features are:

a. The x-values when $f(x) = 0$. ~~Thes~~ At these points $\frac{1}{f(x)}$ is undefined, and $y = \frac{1}{f(x)}$ usually goes to ∞ or $-\infty$ near these points

b. whether $f(x) > 0$ or $f(x) < 0$, since $\frac{1}{f(x)}$ will have the same sign.

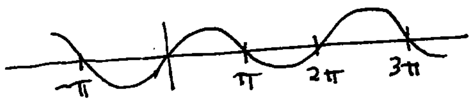
c. The local maxima and minima of $f(x)$, which produce minima and maxima of $\frac{1}{f(x)}$ respectively.

1.3 # 37. $f(x) = \sin(x)$, $g(x) = 1-\sqrt{x}$

$f \circ g(x) = f(g(x)) = f(1-\sqrt{x}) = \sin(1-\sqrt{x})$

domain is all $x \geq 0$, to ensure that $\sqrt{x}$ is defined

$g \circ f(x) = g(f(x)) = g(\sin(x)) = 1 - \sqrt{\sin(x)}$



domain is all x that ~~the~~ satisfy

$2n\pi \leq x \leq (2n+1)\pi$ for some integer n

This ensures that $\sin(x) \geq 0$, so that $\sqrt{\sin(x)}$ is defined.

$f \circ f(x) = f(f(x)) = f(\sin(x)) = \sin(\sin(x))$

domain is all x

$g \circ g(x) = g(g(x)) = g(1-\sqrt{x}) = 1 - \sqrt{1-\sqrt{x}}$

We must have $x \geq 0$ to ensure that $\sqrt{x}$ is defined. Also, we need $1-\sqrt{x} \geq 0$, so $\sqrt{x} \leq 1$ and therefore $x \leq 1$, to ensure that $\sqrt{1-\sqrt{x}}$ is defined.

So the domain is $0 \leq x \leq 1$

1.3#52. $H = f \circ g \circ h$ where $f(x) = \sqrt[3]{x}$, $g(x) = x-1$, and $h(x) = \sqrt{x}$.

Check: $f \circ g \circ h\,(x) = f(g(h(x)))$

$= f(g(\sqrt{x})) = f(\sqrt{x}-1)$

$= \sqrt[3]{\sqrt{x}-1} = H(x).$

1.3#63. g is even and $h = f \circ g$.

Is h always even?

Yes, since $h(-x) = f \circ g\,(-x) = f(g(-x))$

$= f(g(x)) = h(x)$

1.3#64. g is odd and $h = f \circ g$.

Is h always odd?

No, for example if $g(x) = \sin(x)$ and $f(x) = x^2$, then $h(x) = \sin^2 x$ is not odd.

What if f is odd?

Then, h will be odd ~~even~~, since

$h(-x) = f \circ g\,(-x) = f(g(-x))$

$= f(-g(x)) = -f(g(x)) = -h(x).$

What if f is even?

Then, h will even, since

$h(-x) = f(g(-x)) = f(-g(x))$

$= f(g(x)) = h(x).$