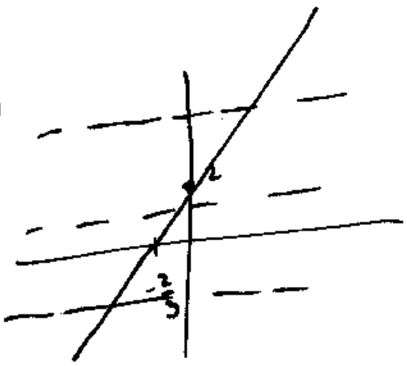
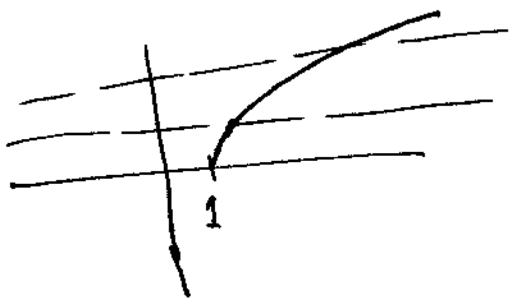
Section 4.1

5. a)



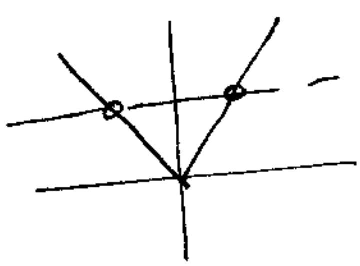
The horizontal line test works so $f(x) = 3x+2$ is one-to-one

b)



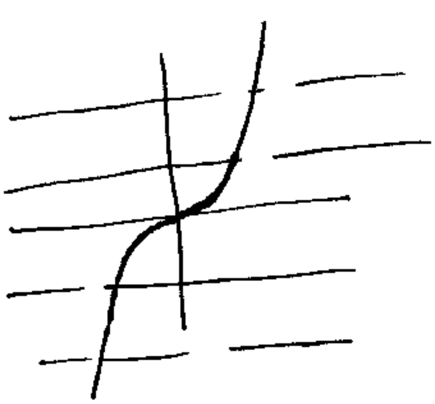
The horizontal line test works so $f(x) = \sqrt{x-1}$ is one-to-one

c)



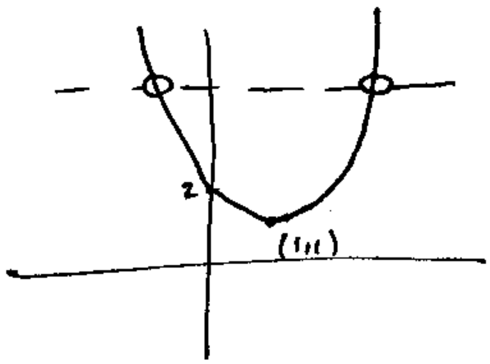
The horizontal line test fails so $f(x) = |x|$ is not one-to one.

d)



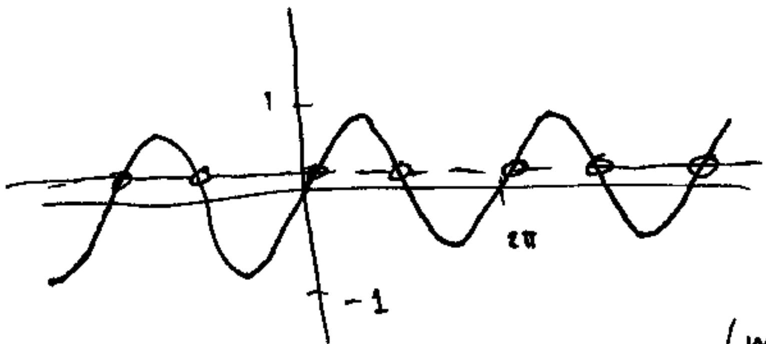
The horizontal line test works so $f(x) = x^3$, is one-to-one.

e)



The horizontal line test **fails** so $f(x) = x^2 - 2x + 2$ is **not** one-to-one.

f)



The horizontal line test **fails** (miserably!), so $f(x) = \sin x$ is **not** one-to-one.

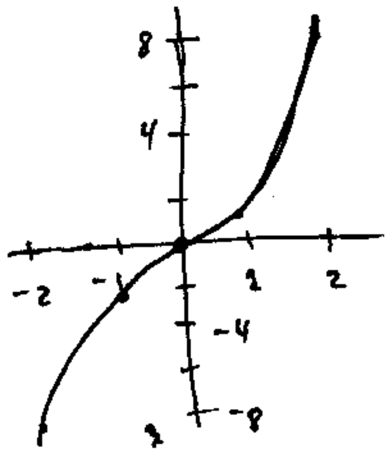
9. (a) f has an inverse, because the horizontal line test works. $f^{-1}(2)$ is 8, since $f(8) = 2$.

$f^{-1}(-1) = -1$, because $f(-1) = -1$.

$f^{-1}(0) = 0$, since $f(0) = 0$.

b) The domain of f^{-1} is the range of f, namely $[-2, 2]$.
The range of f^{-1} is the domain of f, namely $[-8, 8]$

c)



(basically, $f^{-1}(x) = x^3$).

16. $y = \frac{x+1}{x-1}$. To find $f^{-1}(x)$, interchange x and y and solve for y.

$$x = \frac{y+1}{y-1} \Rightarrow (y-1)x = y+1$$
$$\Rightarrow yx - x = y+1$$
$$\Rightarrow yx - y = x+1$$
$$\Rightarrow y = \frac{x+1}{x-1}$$

Thus, $\boxed{f^{-1}(x) = \frac{x+1}{x-1}}$

Check: $f(f^{-1}(x)) = \dfrac{\frac{x+1}{x-1} + 1}{\frac{x+1}{x-1} - 1} = \dfrac{\frac{x+1+x-1}{x-1}}{\frac{x+1-(x-1)}{x-1}}$

$$= \frac{2x}{2} = x. \checkmark$$

18. [redacted] $f(x) = \sqrt[5]{4x+2}$.

$$x = \sqrt[5]{4y+2} \Rightarrow x^5 = 4y+2$$

$$\Rightarrow x^5 - 2 = 4y$$

$$\Rightarrow \boxed{y = \frac{x^5-2}{4}}$$

Check : $f^{-1}(f(x)) = \dfrac{(\sqrt[5]{4x+2})^5 - 2}{4}$

$$= \frac{4x+2-2}{4} = \frac{4x}{4} = x .$$