1.

a) defined bc $\forall x$: $f(x)$ has one output

b) defined $\forall x$ $f(x)$ has one output

c) not defined $x=3$ has two outputs

2. a) the function is always defined bc x^2+5 will never be zero

b) The function is defined bc $\sqrt{x-4} \geq 0$ when the domain is $(5, \infty)$

c) The function is not defined bc $7-4x+4x^2$ equals zero at $\frac{1}{2} \pm \frac{\sqrt{6}}{2}$

3. a) not one to one

b) one to one

c) one to one

d) not one to one

4. a) not onto

b) onto

c) onto

d) not onto

5. a) $v(x) = \frac{(x+2)}{3}$

b) $v(x) = \frac{x+1}{\frac{x}{2}}$

c) $w(n) = n - 3$

6.

a) $g(f(n)) = \dfrac{1}{n^2+1}$

b) $g(f(n)) = 1 - \left(\dfrac{1}{(x^2+1)}\right)$

c) $g(f(n)) = \dfrac{1}{\frac{1}{x-2}} = x-2$

d) $g(f(n)) = \sqrt{x^2+1-1} = x$

e) $g(f(n)) = \dfrac{2(3x-7)}{3x-7-3} = \dfrac{6x-14}{3x-10}$

7.

a)
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

b)
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

c)
$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

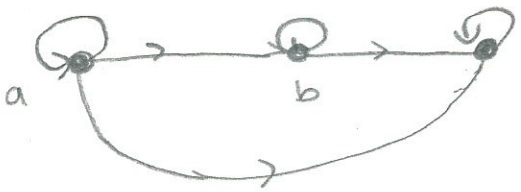
8.

a) reflexive, transitive

b) reflexive, symmetric transitive

c) Symmetric

9.



10.

Reflexive aRa

(a,a) ✓

(b,b) ✓

(c,c) ✓

(d,d) ✓

(e,e) ✓

Symmetric aRb , bRa

(a,e) (e,a) ✓

(a,e) (e,a) ✓

(b,d) (d,b) ✓

(c,e) (e,c) ✓

Transitive aRb , bRc , aRc .

(a,c) , (c,e) , (a,e) ✓