Max M.

P1) $z^3 + 3z^2 - 11z + 2 = 0$

$2^3 + 3(2)^2 - 11(2) + 2 = 0 \rightarrow 0 = 0$, 2 is a solution

$3^3 + 3(3)^2 - 11(3) + 2 = 0 \rightarrow 24 \neq 0$, 3 is not a sol.

P2) $\sin(z) = 0$

$\sin(\pi) = 0$, π is a solution

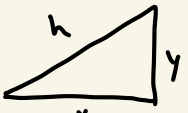
$\sin(\pi/2) = 1$, $\pi/2$ is not a solution

P3) $\sin^2(z) + \cos^2(z) = 1$

$\sin^2(\pi/3) + \cos^2(\pi/3) = 3/4 + 1/4 = 1$, $\pi/3$ is a sol.

$\sin^2(\pi/5) + \cos^2(\pi/5) = 0.345 + 0.655 = 1$, $\pi/5$ is a sol.

P4)



$x^2 + y^2 = h^2$, $\left(\frac{y}{h}\right)^2 + \left(\frac{x}{h}\right)^2 = \frac{y^2 + x^2}{h^2}$

by trig identity, $\sin^2 x + \cos^2 x = 1$, $\mathbb{R}$

P5) $x(t) = t^4$ $\quad x'(t) = 4t^3$ $\quad x''(t) = 12t^2$

$x(2) = 16$ $\quad x'(2) = 32$ $\quad x''(2) = 48$

P6) $f(x) = (x-1)(x-2)(x-3) + x$

$f(1) = 0 + 1 = 1 \rightarrow$ 1 is a fixed point $\quad f(-1) = (-2)(-3)(-4) - 1$

$f(2) = 0 + 1 = 1 \rightarrow$ " $\quad$ " $\quad \neq -1$

$f(3) = 1 \rightarrow$ " $\quad$ " $\quad -1$ is <u>not</u> a fixed point

P7) $f(x,y) = (x+y+1, x-y-2)$

$f(0,-1) = (0-1+1, 0+1-2) = (0,-1) \rightarrow$ fixed point

$f(1,1) = (1+1+1, 1-1-2) = (3,-2) \rightarrow$ not a fixed point

P8) $f(x) = \frac{1}{x+1}$

i. $x(0) = 0.5, x(1) = \frac{2}{3}, x(2) = \frac{3}{5}$

ii. $Orb([1/(x+1)], [x], [0.5], 0, 2]$

iii. $Orb([1/(x+1)], [x], [0.5], 1000, 1000)[1]$

$= 0.618$

P9) i. $f(x,y,z) = \left(\frac{x}{1+y+z}, \frac{y}{1+x+z}, \frac{z}{1+x+y}\right)$

$x(0) = [1,1,1]$

$x(1) = [1/3, 1/3, 1/3]$

$x(2) = [1/5, 1/5, 1/5]$

ii. $Orb([x/(1+y+z), y/(1+x+z), z/(1+x+y)], [x,y,z], [1,1,1], 0, 2)$

iii. $Orb([x/(1+y+z), y/(1+x+z), z/(1+x+y)], [x,y,z], [1,1,1], 1000, 1000)[1]$

$= [1/2001, 1/2001, 1/2001]$

P11) $x(n) = x(n-1)^2 - 2x(n-1) + 2$

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

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0 \quad x=1, x=2$

eq. sol. $x(n) = 1$, $x(n) = 2$

P12) $x(n) = 5/2\, x(n-1)(1-x(n-1))$

$f(x) = 5/2\, x(1-x) = x$

$3/2\, x - 5/2\, x^2 = 0$

$3/2\, x\,(1 - 5/3\, x) = 0$

$x = 0, 3/5 \longrightarrow \underline{x(n) = 0,\ x(n) = 3/5}$

P13) $x(n) = k\, x(n-1)(1-x(n-1))$

$f(x) = kx(1-x) = x$

$kx - kx^2 - x = 0$

$x(k - x - 1) = 0$

$x = 0,\ x = k-1 \longrightarrow x(n) = 0,\ x(n) = k-1$

P11") $f'(x) = 2x - 2$

$f'(1) = 0 < 1 \longrightarrow x = 1$ is stable

$f'(2) = 4 - 2 = 2 > 1 \longrightarrow x = 2$ is not stable

P12") $f'(x) = 3/2 - 5x$

$f'(0) = 3/2 > 1 \longrightarrow x = 0$ is not stable

$f'(3/5) = |-3/2| > 1 \longrightarrow x = 3/5$ is not stable