OK to post

Anne Tomalwar, hw25, 12/2/21

P1) $z^3 + 3(2)^2 - 11(2) + 2$

$= 8 + 12 - 22 + 2 = 0$

so $z=2$ is a solution.

$3^3 + 3(3)^2 - 11(3) + 2$

$= 27 + 27 - 33 + 2 \neq 0$

so $z=3$ is not a solution.

P2) $\sin\pi = 0$

so π is a solution.

$\sin \pi/2 = 1$

so $\pi/2$ is not a solution.

P3) $\forall\, r \in \mathbb{R} \quad \sin^2 r + \cos^2 r = 1$,

so both are solutions.

P4) $\mathbb{R}$

P5) $x(t) = t^4$

$x'(t) = 4t^3 \Rightarrow x'(2) = 32$

$x''(t) = 12t^2 \Rightarrow x''(2) = 48$

P6) $f(1) = 0+1 = 1$, so 1 is fixed.

$f(2) = 0+2 = 2$ so 2 is fixed

$f(3) = 0+3 = 3$ so 3 is fixed

$f(-1) = (-2)(-3)(-4) - 1 \neq -1$

so -1 is not fixed

P7) $f(0,-1) = (0-1+1, 0+1-2)$

$= (0,-1)$, so $(0,-1)$ is a fixed pt.

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

(i) $x(0) = 0.5$

$x(1) = \frac{1}{3/2} = 2/3$

$x(2) = \frac{1}{1+2/3} = \frac{1}{5/3} = 3/5$

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

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

0.61803...

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

$f(0,0,0) = (1,1,1)$

$$f(1,1,1) = \left(\frac{1}{1+1+1}, \frac{1}{1+1+1}, \frac{1}{1+1+1}\right)$$

$$= \left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$$

$$f(y_3, y_3, y_3) = \left(\frac{y_3}{1+y_3+y_3}, \frac{y_3}{1+y_3+y_3}, \frac{y_3}{1+y_3+y_3}\right)$$

$$= \left(y_5, y_5, y_5\right)$$

(ii) Orb([x/(1+y+z), y/(1+x+z), z(1+x+y)], [x, y, z], [1.0, 1.0, 1.0], 0, 2)

(iii) Orb([x/(1+y+z), y/(1+x+z), z(1+x+y)], [x, y, z], [1.0, 1.0, 1.0], 1000, 1000)[1]

$\Rightarrow [0.0004997\ldots, 0.0004997\ldots, 0.0004997\ldots]$

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

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

$(x-2)(x-1) = 0$

$\boxed{x = 1, 2}$

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

$x = 0$

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

$2/5 = 1 - x$

$x = 3/5$

$\boxed{x = 0, 3/5}$

P13) $x = kx(1-x)$

$x = 0$

$1 = k(1-x)$

$1/k = 1-x$

$x = 1 - 1/k$

$x = 0,\ 1 - 1/k$

P11") $f(x) = x^2 - 2x + 2$

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

$f'(1) = 2 - 2 = 0 < 1$ so 1 is stable

$f'(2) = 4 - 2 = 2 > 1$ so 2 is not stable

P(2") $f(x) = 5/2 x(1-x) = 5/2 x - 5/2 x^2$

$f'(x) = 5/2 - 5x$

$f'(0) = 5/2 > 1$ so 0 is not stable

$f'(3/5) = 5/2 - 3 = -1/2$

$|-1/2| < 1$ so 3/5 is stable