1)

$$\frac{i-1}{i+1} = i$$

2)

$$1+i = \sqrt{2}\, e^{i\,45} \Longrightarrow (1+i)^4 = 4\, e^{i\,180} = -4$$

3)

$$(-3+2i)(2-i) = -4+7i = \sqrt{65}\, e^{i\,119.75}$$

4)

$$-4x^3+3x^2+25x+6 = -(x-3)(4x^2+9x+2)$$

Autres racines : $x=-2$ et $x=-\dfrac{1}{4}$

5)

$$\frac{3x^3+4x+11}{x^2-3x+2} = 3x+9+\frac{25x-7}{x^2-3x+2}$$

$$\frac{3x^3+4x+11}{x^2-3x+2} = 3x+9+\frac{A}{x-2}+\frac{B}{x-1} = 3x+9+\frac{43}{x-2}-\frac{18}{x-1}$$

6)

$$\lim_{x\to+\infty}\frac{(x-2)(2x^2+3)}{x(x-1)^2} = 2$$

$$\lim_{x\to 2}\frac{x^2+4x-12}{x^2-2x} = \lim_{x\to 2}\frac{(x+6)(x-2)}{x(x-2)} = \lim_{x\to 2}\frac{(x+6)}{x} = 4$$

$$\lim_{x\to -3}\frac{2x+1}{x+3} = -\infty$$

$$\lim_{x\to-\infty}\frac{8x^7-6x^3+4}{-9x^5+12x^3-6x} = -\infty$$

$$\lim_{x\to 0}\frac{\cos(2x)-1}{x^3+5x^2} = \lim_{x\to 0}\frac{-2\sin(2x)}{3x^2+10x} = \lim_{x\to 0}\frac{-4\cos(2x)}{6x+10} = -\frac{2}{5}$$

7)

$$\ddot{y}(t) - 3\,\dot{y}(t) + 2\,y(t) = e^{3t}$$

with: $\quad y(0^-)=1 \quad ; \quad \dot{y}(0^-)=0$

$$(p^2\,Y(p) - p) - 3(p\,Y(p) - 1) + 2Y(p) = \frac{1}{p-3}$$

$$(p^2 - 3p + 2)\,Y(p) = p - 3 + \frac{1}{p-3}$$

$$(p^2 - 3p + 2)\,Y(p) = \frac{p^2 - 6p + 10}{p-3}$$

$$Y(p) = \frac{p^2 - 6p + 10}{(p-3)(p^2 - 3p + 2)}$$

$$Y(p) = \frac{p^2 - 6p + 10}{(p-1)(p-2)(p-3)}$$

$$Y(p) = \frac{A}{p-1} + \frac{B}{p-2} + \frac{C}{p-3}$$

$$A = \frac{5}{2} \quad ; \quad B = -2 \quad ; \quad C = \frac{1}{2}$$

$$Y(p) = \frac{5}{2}\,\frac{1}{p-1} - 2\,\frac{1}{p-2} + \frac{1}{2}\,\frac{1}{p-3}$$

$$y(t) = \frac{5}{2}\,e^{t} - 2\,e^{2t} + \frac{1}{2}\,e^{3t}$$

8)

$$F(p) = \frac{2}{p^2 + 2p + 10} = \frac{2}{(p+1)^2 + 9} = \frac{2}{(p+1)^2 + 3^2} = \frac{2}{3}\,\frac{3}{(p+1)^2 + 3^2}$$

$$f(t) = \frac{2}{3}\,e^{-t}\,\sin(3t)$$