departamento de matemática **universidade de aveiro**

1. Fatorize ao máximo os seguintes polinómios:

   (a) $x^3 - 7x^2 + 3x$

   (b) $x^4 + 3x^2 - 4x^3$

   (c) $x^4 + 9x + 18 - x^3 - 11x^2$

   (d) $6x^3 - 2 - x + 7x^2$

   (e) $x^4 - \frac{1}{4}x^3 - x^2 + \frac{1}{4}x$

   (f) $3x^4 + 27x + 30 - 6x^2$

   (g) $x^3 + x^2$

   (h) $3x^3 + 24x^4 - 12x^5$

   (i) $x^3 - 31x - 30$

   (j) $4x^3 + 20x^2 + 33x + 18$

   (k) $x^5 - 4x^3 - x^2 + 4$

   (l) $21x^2 + 5x^4 - 4x - 20x^3 + 4$

   (m) $3x^3 + 13x + 35 - 19x^2$

   (n) $x^4 + 3x^3 - 3x^2 - 11x - 6$

   (o) $2x^4 - 14x - 28 + 10x^2 - 2x^3$

   (p) $3x^5 - 3x^4 - 51x^3 - 45x^2$

2. Resolva e indique o conjunto solução das seguintes equações:

   (a) $x^3 - 7x^2 + 3x = 0$

   (b) $x^4 + 3x^2 = 4x^3$

   (c) $x^4 + 9x + 18 = x^3 + 11x^2$

   (d) $6x^3 - 2 = x - 7x^2$

   (e) $x^4 - \frac{1}{4}x^3 - x^2 + \frac{1}{4}x = 0$

   (f) $3x^4 + 27x + 30 = 6x^2$

   (g) $\sqrt{2x+3} = 1$

   (h) $\sqrt{3x-2} - 1 = 0$

   (i) $\frac{1}{2} - \sqrt{3x-2} = 0$

   (j) $\sqrt{x+5} - \sqrt{2x-1} = 0$

   (k) $\sqrt{x^2+5} - \sqrt{5-x} = 0$

   (l) $\sqrt{x^2+1} = \sqrt{\frac{x^2}{2}+1}$

   (m) $\sqrt{2-2x} = x + 3$

   (n) $\sqrt{x} + 2 - x = 0$

   (o) $x - \sqrt{7-3x} = 1$

   (p) $\sqrt{4-x^2} = x$

   (q) $\frac{5+x^2}{x+3} = 0$

   (r) $x + \frac{6}{x} = -7$

(s) $x - \dfrac{15}{x-7} = -3$

(t) $\dfrac{x}{x+3} + \dfrac{x}{x-2} = \dfrac{1}{(x+3)(x-2)}$

(u) $\dfrac{2-x}{x} + \dfrac{1}{x^2} = \dfrac{3}{x}$

(v) $\dfrac{x+2}{x+1} = \dfrac{2x}{x-4}$

(w) $\dfrac{x+2}{x-2} + \dfrac{x-2}{x+2} = 1$

(x) $\dfrac{3}{x^2-4} + \dfrac{1}{x-3} = 0$

(y) $\dfrac{x+3}{2x-1} = \dfrac{2x}{x+4}$

(z) $\dfrac{3}{x^2-4} + \dfrac{1}{x-2} = 0$

(aa) $\dfrac{1}{x-1} + \dfrac{1}{x+1} = \dfrac{2x^2}{x^2-1}$

(ab) $\dfrac{x+7}{x+5} - \dfrac{12}{x-5} = \dfrac{1}{x^2-25}$

(ac) $\dfrac{x}{x-2} + \dfrac{x}{x+1} = 2$

(ad) $\dfrac{x+3}{x} = \dfrac{x+9}{x+4}$

(ae) $\dfrac{3x}{x-4} + \dfrac{2}{x} = 3$

(af) $\dfrac{x+7}{x+5} - \dfrac{12}{x-5} = 1$

(ag) $\dfrac{2}{x-1} + \dfrac{1}{x^2-1} = 0$

(ah) $\dfrac{3}{x-2} + \dfrac{2}{x} = \dfrac{7}{x^2-4}$

(ai) $\dfrac{x}{x+3} - 1 = \dfrac{5}{x^2-9}$

(aj) $|x-2| = 6$

(ak) $\left|-\dfrac{x+7}{4} - 2\right| - \dfrac{3}{2} = 0$

(al) $-\left|-\dfrac{x+1}{5} - \dfrac{x}{2}\right| = \dfrac{7}{2}$

(am) $|x-3| = |4x-1|$

(an) $|2x-1| = x+2$

(ao) $\left|2x^2+15x-3\right| = x^2+2x-3$

(ap) $|x-5| - |7-2x| = 0$

3. Indique o conjunto solução das seguintes equações.

(a) $\left|\dfrac{x-3}{2x-1}\right| = 1$

(b) $\left|\dfrac{x^2+3}{x-1}\right| = 2$

(c) $\dfrac{|3x-5|-1}{x^2-1} = 0$

(d) $\sqrt{\dfrac{x+1}{x+2}} = -2$

(e) $x^2 - 2|x| - 3 = 0$

(f) $|x+2| = \sqrt{4-x}$

(g) $|x+3| + |2x-5| = 3$

(h) $\left|\sqrt{\dfrac{x}{2x-1}}\right| = 1$

1. (a) $x\left(x-\frac{7+\sqrt{37}}{2}\right)\left(x-\frac{7-\sqrt{37}}{2}\right)$; (b) $x^2(x-3)(x-1)$; (c) $(x+1)(x-2)(x+3)(x-3)$;
   (d) $6(x+1)\left(x-\frac{1}{2}\right)\left(x+\frac{2}{3}\right)$; (e) $x(x-1)\left(x-\frac{1}{4}\right)(x+1)$;
   (f) $3(x+1)(x+2)\left(x^2-3x+5\right)$; (g) $x^2(x+1)$; (h) $-12x^3\left(x-\frac{-8+\sqrt{80}}{-8}\right)\left(x+\frac{-8+\sqrt{80}}{-8}\right)$;
   (i) $(x+1)(x+5)(x-6)$; (j) $(x+2)(2x+3)^2$; (k) $(x-1)(x+2)(x-2)\left(x^2+x+1\right)$;
   (l) $(x-2)^2\left(5x^2+1\right)$; (m) $3(x+1)\left(x-\frac{7}{3}\right)(x-5)$; (n) $(x-2)(x+1)(x+3)(x+1)$;
   (o) $2(x-2)(x+1)\left(x^2+7\right)$; (p) $3x^2(x+3)(x-5)(x+1)$.
2. (a) $\left\{0, \frac{7-\sqrt{37}}{2}, \frac{7+\sqrt{37}}{2}\right\}$; (b) $\{0,1,3\}$; (c) $\{-3,-1,2,3\}$; (d) $\left\{-1,-\frac{2}{3},\frac{1}{2}\right\}$;
   (e) $\left\{-1,0,\frac{1}{4},1\right\}$; (f) $\{-2,-1\}$; (g) $\{-1\}$; (h) $\{1\}$; (i) $\left\{\frac{3}{4}\right\}$; (j) $\{6\}$;
   (k) $\{-1,0\}$; (l) $\{0\}$; (m) $\{-1\}$; (n) $\{4\}$; (o) $\{2\}$; (p) $\left\{\sqrt{2}\right\}$; (q) $\emptyset$; (r) $\{-6,-1\}$;
   (s) $\left\{\frac{4-\sqrt{160}}{2}, \frac{4+\sqrt{160}}{2}\right\}$; (t) $\left\{-1,\frac{1}{2}\right\}$; (u) $\left\{\frac{1-\sqrt{5}}{-2}, \frac{1+\sqrt{5}}{-2}\right\}$; (v) $\emptyset$; (w) $\emptyset$;
   (x) $\left\{\frac{-3-\sqrt{61}}{2}, \frac{-3+\sqrt{61}}{2}\right\}$; (y) $\{-1,4\}$; (z) $\{-5\}$; (aa) $\{0\}$; (ab) $\{-6,16\}$; (ac) $\{-4\}$;
   (ad) $\{6\}$; (ae) $\left\{\frac{4}{7}\right\}$; (af) $\{-7\}$; (ag) $\left\{-\frac{3}{2}\right\}$; (ah) $\left\{\frac{1-\sqrt{161}}{10}, \frac{1+\sqrt{161}}{10}\right\}$; (ai) $\left\{\frac{4}{3}\right\}$;
   (aj) $\{-4,8\}$; (ak) $\{-21,-9\}$; (al) $\emptyset$; (am) $\left\{-\frac{2}{3},\frac{4}{5}\right\}$; (an) $\left\{-\frac{1}{3},3\right\}$; (ao) $\{-13,-6\}$;
   (ap) $\{2,4\}$.
3. (a) $\left\{-2,\frac{4}{3}\right\}$; (b) $\{-1\}$; (c) $\left\{\frac{4}{3},2\right\}$; (d) $\emptyset$; (e) $\{-3,3\}$; (f) $\{-5,0\}$; (g) $\emptyset$; (h) $\{1\}$.