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1. Realizar la siguiente operación:

1.  $2x^2(x-1)-(x-1)(x+2)$

2.  $x(x^2-1)-2(x+2)(x-2)$

3.  $2x^2-x^2(x+1)(x-2)-2x^2-x^2(x^2-x-2)$

4.  $2(x-2)^2-2x(x^2-2)^2$

5.  $x(x+1)^2-(x-1)(x-2)^2$

6.  $2x(2x-1)^2-(2x^2-x)^2$

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

8.  $2x(2x-1)^2-(x^2-2x)^2-x(x^2-2x-3)^2$

2. Realizar la siguiente división:

1.  $(x^4-3x^2+1):(x-2)$

2.  $(3x^5+3x^3-2x):(x+2)$

3.  $(x^4-1):(x+1)$

4.  $(5m-2m^3+m^2-8):(m-3)$

5.  $(x^2+4ax+3a^2):(x+a)$

6.  $(x^4+3ax^3-10a^2x^2+3x-6a):(x-2a)$

3. Hallar **m** para que el polinomio  $3x^2-mx+10$  sea divisible por  $x-5$ .

4. Hallar **m** para que el polinomio  $5x^4+mx^3+2x-3$  sea divisible por  $x+1$ .

5. Hallar **m** para que resto de dividir  $5x^4-7x^3+2x^2+4x+m$  por  $x+2$  sea 130.

6. Hallar un polinomio de primer grado que al dividirlo por  $x+1$  dé de resto 2, y al dividirlo por  $x-2$  dé de resto 5.

7. Hallar un polinomio de segundo grado que se anule para  $x=0$ , sea divisible por  $x+2$  y al dividirlo por  $x-1$  el resto sea 6.

8. Hallar **a** y **b** para que el polinomio  $x^5+ax^3+b$  sea divisible por  $x+1$  y  $x-1$ .

9. Hallar **a**, **b** y **c** para que el polinomio  $x^5+ax^4+bx+c$  sea divisible por  $x-3$ ,  $x+1$  y  $x-1$ .

10. Descomponer al máximo el polinomio:

1.  $5x+25x^2$

2.  $4x^5+2x^4+8x^2$

3.  $4x^2-1$

4.  $x^4-9$

5.  $4x^2+12x+9$

6.  $4x^4-4x^2+1$

7.  $x^2-x-6$

8.  $2x^2-3x-2$

9.  $2x^3-2x$

10.  $4x^4-9x^2$

11.  $4x^3-4x^2+x$

12.  $18x^4-24x^3+8x^2$

13.  $16x^4-8x^2+1$

14.  $81x^4-72x^2+16$

15.  $2x^3+2x^2-4x$

16.  $x^5+5x^4+6x^3$

17.  $x^3+4x^2+x-6$

18.  $x^3-x^2+x-1$

11. Simplificar las siguientes raíces:

1.  $\sqrt{x^6+x^4}$

2.  $\sqrt{x^4+4x^2+4}$

3.  $\sqrt{4x^3+4x^2-4x-4}$

4.  $\sqrt[3]{x^3-6x^2+12x-8}$

12. Calcular el m.c.d. y m.c.m. de los siguientes polinomios:

$$\begin{array}{lllll}
1. \begin{cases} x^2 \\ 2x^3 \\ 4x^4 \end{cases} & 2. \begin{cases} x^3 \\ 4x^2 \\ x^3-x^2 \end{cases} & 3. \begin{cases} 2x^2+2x \\ x^4-x^2 \\ 4x^2+8x+4 \end{cases} & 4. \begin{cases} 8x-4 \\ 8x^3-2x \\ 2x^4-5x^3+2x^2 \end{cases} & 5. \begin{cases} x^2-2x-3 \\ x^2-x-6 \\ x^2+3x+2 \end{cases} \\
6. \begin{cases} 4x^3+4x^2+x \\ 2x^4+5x^3+2x^2 \\ 2x^3+8x^2+8x \end{cases} & 7. \begin{cases} 8x^3+24x^2+18x \\ 2x^4-x^3-6x^2 \\ x^3-x^2-2x \end{cases} & & 8. \begin{cases} x^4-1 \\ x^3+x^2-x-1 \\ x^3-x^2-x+1 \end{cases} & 9. \begin{cases} 2x^2-2x \\ 1-x^2 \\ x^2+2x+1 \end{cases} \\
10. \begin{cases} x^2-x-2 \\ 4-x^2 \\ x^2+x-6 \end{cases} & 11. \begin{cases} x^3-x^2 \\ 1-x^2 \\ x^2-3x+2 \end{cases} & 12. \begin{cases} 2+x-x^2 \\ x^2-5x+6 \\ 3+2x-x^2 \end{cases} & & 
\end{array}$$

**13.** Simplificar la fracción algebraica:

$$\begin{array}{llll}
1. \frac{6x-4}{9x^2-4} & 2. \frac{2+x-x^2}{x^3-3x^2+4} & 3. \frac{x^2+5x+6}{x^2-4} & 4. \frac{4x^2-1}{3-6x} \\
5. \frac{3x^3-6x^2+3x}{2x-x^2-x^3} & 6. \frac{2x^2-2x-12}{2x^2+2x-4} & 7. \frac{x^4-6x^3+9x^2}{2x^4-10x^3+12x^2} & 8. \frac{16x^4-72x^2+81}{9-3x-8x^2+4x^3} \\
9. \frac{x^4-2x^3-3x^2+4x+4}{x^4-8x^2+16} & 10. \frac{12x^2-2x^3-2x^4}{3x^4+12x^3-9x^2-54x} & 11. \frac{2x^2-ax-a^2}{2x^2-2x+ax-a} & 
\end{array}$$

**14.** Hallar el valor numérico de la fracción:

$$\begin{array}{ll}
1. \frac{x^2+3x+2}{x^2+4x+4} \text{ para } x = -2 & 2. \frac{x^2-9}{x^2-2x-3} \text{ para } x = 3 \\
3. \frac{4x^2-1}{2x^2-5x-3} \text{ para } x = -\frac{1}{2} & 4. \frac{2x^3-6x^2+4x}{2x^2-x^3} \text{ para } x = 2 \\
5. \frac{x^3-4x^2-3x+18}{x^3+x^2-8x-12} \text{ para } x = -2 & 6. \frac{x^4-2x^3-3x^2+4x+4}{x^4+x^3-3x^2-5x-2} \text{ para } x = -1 \\
7. \frac{3x^3-5x^2-4x+4}{2+x-4x^2-3x^3} \text{ para } x = \frac{2}{3} & 8. \frac{2x^3-x^2-4x+3}{4x^3+20x^2+33x+18} \text{ para } x = -\frac{2}{3}
\end{array}$$

**15.** Pasar a común denominador:

$$\begin{array}{ll}
1. 2 ; \frac{2}{x} ; \frac{1}{2x^2} ; \frac{x+1}{4x} & 2. \frac{1}{x} ; \frac{2x-1}{x+1} ; \frac{x-1}{x^2+x} ; \frac{2x+2}{x^2-1} \\
3. \frac{x+2}{x-2} ; \frac{2x+3}{4-2x} ; \frac{x^2-1}{x^2-4} ; \frac{x-3}{4x^2-16x+16} & 4. \frac{x-2}{x^2-x-2} ; \frac{3x-1}{2x^2-8x+8} ; \frac{x^2+5}{x^3-3x-2} ; x \\
5. x-1 ; \frac{x-1}{x^2} ; \frac{x-2}{x^2-x} ; \frac{x^2-1}{2x^3-4x^2+2x} & 6. \frac{2x+1}{x^2-4} ; \frac{x}{2x^2-4x} ; \frac{2x-3}{x^3-4x^2+4x}
\end{array}$$

**16.** Realizar la siguiente operación:

$$1. 1 - \frac{2x-x^2}{x-1} - x$$

$$2. \frac{2-3x}{x^2-4} - x + 1 - \frac{3x-2x^2}{2x-4}$$

$$3. \frac{x}{x-1} - \frac{4}{4x^2-4} - \frac{2x}{2x^2-4x+2} - 1$$

$$4. \frac{x+1}{x^2+x-2} - \frac{x-2}{x^2-2x+1} + \frac{2}{2x^2+4x}$$

$$5. \frac{x+2}{4x+4a} - \frac{1}{2a-2x} - \frac{x}{x^2-a^2}$$

$$6. \frac{2x^4}{2x^2-x} - \frac{4x^4-x^3}{4x^4-x^2} - x^2 + x$$

$$7. \frac{2x+1}{x^2+x-2} + \frac{4}{x^2-4} - \frac{2x-1}{x^2-3x+2}$$

$$8. \frac{2x+1}{2x+4} - \frac{x^2-1}{2x-x^2} - \frac{7x-2}{2x^2-8}$$

$$9. \frac{x^3+a^3}{x^2-a^2} - x + a + \frac{2ax+1}{2a-2x}$$

$$10. \frac{2y-x}{2x+2y} + \frac{2y^2}{x^2-y^2} - \frac{xy}{x^2-xy}$$

$$11. \frac{4-x^2}{x^2+2x+1} \cdot \frac{x+1}{x^2+4x+4}$$

$$12. \frac{2x^3-4x^2-6x}{x^2-2x-15} \cdot \frac{2x^2-4x-30}{x^4-2x^3-3x^2}$$

$$13. \frac{4x^3-9x}{2x^2-3x-2} : \frac{2x^4-x^3-6x^2}{2x^2-8x+8}$$

$$14. \frac{x^2-5x+6}{4x-x^2-3} : \frac{6-x-x^2}{x^2+x-2}$$

**17.** Realizar la siguiente operación:

$$1. \left(1 - \frac{1}{x} - \frac{2}{x^2}\right) \left(\frac{x^2}{x-2} - x\right)$$

$$2. \left(\frac{12}{x^2-x-6} - 2x+1\right) : \left(2x - \frac{6-x}{x-3}\right)$$

$$3. \left(\frac{2x^2}{x^2-1} - \frac{x-1}{2x+2} - 1\right) \frac{2x^2-2}{x^2-x-2}$$

$$4. \left(\frac{x}{x-1} - 1\right) \left(\frac{x^2+3}{x^2-1} - \frac{x-1}{x+1}\right)^{-2}$$

$$5. \left(\frac{3x^2-x}{x^2-4} - \frac{2x+1}{2x-4} - 1\right) \left(\frac{4x^2+5}{2x-3} - x+1\right)$$

$$6. (x+3) \left(\frac{x+1}{x-3} - \frac{x^2-1}{x^2-9}\right) - 2(x+1) : \left(2 - \frac{8}{x+1}\right)$$

$$7. \left(\frac{x^2+2}{4x^2-1} + \frac{x-2}{2-4x}\right) : \left(\frac{3x^2-3}{4x^2+4x+1} - 1\right)$$

$$8. \left(\frac{x^2+1}{2x^2-6x} - \frac{3}{x^2-x-6} - \frac{x+3}{2x+4}\right) : \frac{2x+2}{x^3-3x^2}$$

$$9. \left(\frac{1}{x^2-1} - \frac{1}{2-2x}\right) \frac{x^2-x-2}{x^2+3x}$$

$$10. \left(\frac{x+1}{x} - \frac{3x+2}{2x^2-4x} - \frac{x+2}{4x}\right) \frac{x^3-2x^2}{3x^2-x-2}$$

$$11. \left(\frac{1}{2x-6} - \frac{2x}{x^3-2x^2-x-6}\right) \left(\frac{2x}{3x-2-x^2} + \frac{x+1}{x^2-x}\right)$$

$$12. \left(\frac{x+1}{x^2-ax} - \frac{x-a}{ax+a^2} - \frac{3ax-x^2}{ax^2-a^3}\right) \left(\frac{a-1}{x-1} - 1\right)$$

$$13. \left(\frac{1-2x}{x-2} - x\right) : \left[\left(\frac{x^2-4x}{x^2-4} - 1\right) : \left(1 - \frac{5x+1}{x^2+3x+2}\right)\right]$$

— Soluciones —

- 1.1.**  $2x^3-3x^2-x+2$  **1.2.**  $x^3-2x^2-x+8$  **1.3.**  $-2x^4+2x^3+4x^2$  **1.4.**  $-2x^5+8x^3+2x^2-16x+8$  **1.5.**  $7x^2-7x+4$  **1.6.**  $-4x^4+12x^3-9x^2+2x$  **1.7.**  $-2x^5+8x^4-15x^3+10x^2+4x-8$  **1.8.**  $-x^5+3x^4+14x^3-24x^2-7x$  **2.1.**  $x^3+2x^2+x+2$ ; 5 **2.2.**  $3x^4-6x^3+15x^2-30x+58$ ; -116 **2.3.**  $x^3-x^2+x-1$ ; 0 **2.4.**  $-2m^2-5m-10$ ; -38 **2.5.**  $x+3a$ ; 0 **2.6.**  $x^3+5ax^2+3$ ; 0 **3.** 17 **4.** 0 **5.** -6 **6.**  $x+3$  **7.**  $2x^2+4x$  **8.** -1; 0 **9.** -3; -1; 3 **10.1.**  $5x(1+5x)$  **10.2.**  $2x^2(x^3+x^2+8)$  **10.3.**  $(2x+1)(2x-1)$  **10.4.**  $(x^2+3)(x^2-3)$  **10.5.**  $(2x+3)^2$  **10.6.**  $(2x^2-1)^2$  **10.7.**  $(x+2)(x-3)$  **10.8.**  $(x-2)(2x+1)$  **10.9.**  $2x(x+1)(x-1)$  **10.10.**  $x^2(2x+3)(2x-3)$  **10.11.**  $x(2x-1)^2$  **10.12.**  $2x^2(3x-2)^2$  **10.13.**  $(2x+1)^2(2x-1)^2$  **10.14.**  $(3x+2)^2(3x-2)^2$  **10.15.**  $2x(x+2)(x-1)$  **10.16.**  $x^3(x+2)(x+3)$  **10.17.**  $(x-1)(x+2)(x+3)$  **10.18.**  $(x-1)(x^2+1)$  **11.1.**  $x^2\sqrt{x^2+1}$  **11.2.**  $x^2+2$  **11.3.**  $2(x+1)\sqrt{x-1}$  **11.4.**  $x-2$  **12.1.**  $x^2$ ;  $4x^4$  **12.2.**  $x^2$ ;  $4x^3(x-1)$  **12.3.**  $x+1$ ;  $4x^2(x+1)^2(x-1)$  **12.4.**  $2x-1$ ;  $4x^2(2x+1)(2x-1)(x-2)$  **12.5.** 1;  $(x+1)(x+2)(x-3)$  **12.6.**  $x$ ;  $2x^2(2x+1)^2(x+2)^2$  **12.7.**  $x$ ;  $2x^2(x+1)(x+2)(x-2)(x-3)(2x+3)^2$  **12.8.**  $(x+1)(x-1)$ ;  $(x^2+1)(x+1)^2(x-1)^2$  **12.9.** 1;  $2x(x-1)(x+1)^2$  **12.10.**  $x-2$ ;  $(x+1)(x+2)(x-2)(x+3)$  **12.11.**  $x-1$ ;  $x^2(x+1)(x-1)(x-2)$  **12.12.** 1;  $(x+1)(x-2)(x-3)$  **13.1.**  $\frac{2}{3x+2}$  **13.2.**  $\frac{1}{2-x}$  **13.3.**  $\frac{x+3}{x-2}$  **13.4.**  $-\frac{2x+1}{3}$  **13.5.**  $-\frac{3(x-1)}{x+2}$  **13.6.**  $\frac{x-3}{x-1}$  **13.7.**  $\frac{x-3}{2(x-2)}$  **13.8.**  $\frac{(2x+3)^2}{x+1}$  **13.9.**  $\frac{(x+1)^2}{(x+2)^2}$  **13.10.**  $\frac{-2x}{3(x+3)}$  **13.11.**  $\frac{x-a}{x-1}$  **14.1.** No **14.2.**  $\frac{3}{2}$  **14.3.**  $\frac{4}{7}$  **14.4.** -1 **14.5.** No **14.6.** No **14.7.**  $\frac{4}{5}$  **14.8.** 0 **15.1.**  $\frac{8x^2}{4x^2}$ ;  $\frac{8x}{4x^2}$ ;  $\frac{2}{4x^2}$ ;  $\frac{x^2+x}{4x^2}$  **15.2.**  $\frac{x^2-1}{x(x+1)(x-1)}$ ;  $\frac{2x^3-3x^2+x}{x(x+1)(x-1)}$ ;  $\frac{x^2-2x+1}{x(x+1)(x-1)}$ ;  $\frac{2x^2+2x}{x(x+1)(x-1)}$  **15.3.**  $\frac{4x^3+8x^2-16x-32}{4(x+2)(x-2)^2}$ ;  $\frac{-4x^3-6x^2+16x+24}{4(x+2)(x-2)^2}$ ;  $\frac{4x^3-8x^2-4x+8}{4(x+2)(x-2)^2}$ ;  $\frac{x^2-x-6}{4(x+2)(x-2)^2}$  **15.4.**  $\frac{2x^3-6x^2+8}{2(x+1)^2(x-2)^2}$ ;  $\frac{3x^3+5x^2+x-1}{2(x+1)^2(x-2)^2}$ ;  $\frac{2x^3-4x^2+10x-20}{2(x+1)^2(x-2)^2}$ ;  $\frac{2x^5-4x^4-6x^3+8x^2+8x}{2(x+1)^2(x-2)^2}$  **15.5.**  $\frac{2x^5-6x^4+6x^3-2x^2}{2x^2(x-1)^2}$ ;  $\frac{2x^3-6x^2+6x-2}{2x^2(x-1)^2}$ ;  $\frac{2x^3-6x^2+4x}{2x^2(x-1)^2}$ ;  $\frac{x^3-x}{2x^2(x-1)^2}$  **15.6.**  $\frac{4x^3-6x^2-4x}{2x(x+2)(x-2)^2}$ ;  $\frac{x^3-4x}{2x(x+2)(x-2)^2}$ ;  $\frac{4x^2+2x-12}{2x(x+2)(x-2)^2}$  **16.1.**  $\frac{1}{1-x}$  **16.2.**  $\frac{3x-2}{2(x-2)}$  **16.3.**  $\frac{-2x}{(x+1)(x-1)^2}$  **16.4.**  $\frac{x^2+x+1}{2(x+1)(x-1)^2}$  **16.5.**  $\frac{x}{4(x+a)}$  **16.6.**  $\frac{3x^2}{2x+1}$  **16.7.**  $\frac{-2}{(x-1)(x-2)}$  **16.8.**  $\frac{2x^2+x+1}{x(x+2)}$  **16.9.**  $\frac{1}{2(a-x)}$  **16.10.**  $\frac{-x}{2(x+y)}$  **16.11.**  $\frac{2-x}{(x+1)(x+2)}$  **16.12.**  $\frac{4}{x}$  **16.13.**  $\frac{2(2x-3)}{x(2x+1)}$  **16.14.**  $\frac{x+2}{x+3}$  **17.1.**  $\frac{2(x+1)}{x}$  **17.2.**  $\frac{-(x+1)}{x+2}$  **17.3.**  $\frac{x+1}{x-2}$  **17.4.**  $\frac{x-1}{4}$  **17.5.**  $\frac{2x+1}{2}$  **17.6.**  $-x-1$  **17.7.**  $\frac{-3(2x+1)}{2(x+2)(2x-1)}$  **17.8.**  $\frac{x(x+1)}{2(x+2)}$  **17.9.**  $\frac{x-2}{2x(x-1)}$  **17.10.**  $\frac{x(x-4)}{4(x-1)}$  **17.11.**  $\frac{1}{2x(3-x)}$  **17.12.**  $\frac{1}{x(1-x)}$  **17.13.**  $\frac{(x-1)^2}{4}$