

# Advanced Precalculus: HW Key 2/10/12

$$\textcircled{1} \quad 4 \overline{) \begin{array}{r} 11 \\ -3 \\ 8 \\ -20 \\ \hline 4 \\ 4 \\ 48 \end{array}}$$

$$\begin{array}{r} 1x^2 \\ x \\ 12 \\ 28 \\ R \end{array}$$

$$x^3 - 3x^2 + 8x - 20 = (x-4)(x^2 + x + 12) + 28$$

$$\textcircled{2} \quad 3 \overline{) \begin{array}{r} 1 \\ 0 \\ 3 \\ -5 \\ 0 \\ -12 \end{array}}$$

$$\begin{array}{r} 1x^4 \\ 3x^3 \\ 12x^2 \\ 31x \\ 93 \\ 267 \\ R \end{array}$$

$$x^5 + 3x^3 - 5x^2 - 12 = (x-3)(x^4 + 3x^3 + 12x^2 + 31x + 93) + 267$$

$$\textcircled{3} \quad -1 \overline{) \begin{array}{r} 5 \\ 0 \\ 0 \\ 0 \\ -4 \\ 2 \\ 0 \\ -1 \end{array}}$$

$$\begin{array}{r} 5 \\ -5 \\ 5 \\ -5 \\ 1 \\ 1 \\ -1 \\ 0 \\ R \end{array}$$

$$\begin{array}{r} 5x^6 \\ x^5 \\ x^4 \\ x^3 \\ x^2 \\ x \\ 1 \\ 0 \\ R \end{array}$$

$$5x^7 - 4x^3 + 2x^2 - 1 = (x+1)(5x^6 - 5x^5 + 5x^4 - 5x^3 + x^2 + x - 1)$$

$$\textcircled{4} \quad 1 \overline{) \begin{array}{r} 1 \\ 8 \\ 0 \\ 0 \\ -5 \\ 0 \\ 2 \\ 0 \\ -1 \end{array}}$$

$$\begin{array}{r} 1x^8 \\ 8x^7 \\ 9x^6 \\ 9x^5 \\ 4x^4 \\ 4x^3 \\ 4x^2 \\ 6x \\ 6 \\ 5 \\ R \end{array}$$

$$x^9 + 8x^7 - 5x^4 + 2x^2 - 1 = (x-1)(x^8 + x^7 + 9x^6 + 9x^5 + 9x^4 + 4x^3 + 4x^2 + 6x + 6) + 5$$

$$\textcircled{5} \quad -1 \overline{) \begin{array}{r} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -1 \end{array}}$$

$$\begin{array}{r} 1 \\ -1 \\ 1 \\ -1 \\ 1 \\ -1 \\ 1 \\ -1 \\ 1 \\ -1 \\ 1 \\ -2 \\ R \end{array}$$

$$\begin{array}{r} 1x^9 \\ x^8 \\ x^7 \\ x^6 \\ x^5 \\ x^4 \\ x^3 \\ x^2 \\ x \\ 1 \\ 0 \\ -2 \\ R \end{array}$$

$$x^9 - 1 = (x-1)(x^8 - x^7 + x^6 - x^5 + x^4 - x^3 + x^2 - x + 1) - 2$$

$$\textcircled{6} \quad 1 \overline{) \begin{array}{r} 8 \\ 0 \\ 0 \\ 0 \\ 0 \\ -7 \\ 0 \\ 0 \\ 4 \\ 0 \\ -2 \end{array}}$$

$$\begin{array}{r} 8 \\ 8 \\ 8 \\ 8 \\ 8 \\ 1 \\ 1 \\ 1 \\ 5 \\ 5 \\ 3 \\ R \end{array}$$

$$8x^{10} - 7x^5 + 4x^2 - 2 = (x-1)(8x^9 + 8x^8 + 8x^7 + 8x^6 + 8x^5 + x^4 + x^3 + x^2 + 5x + 5) + 3$$

$$\textcircled{7} \quad \frac{5}{3} \overline{) \begin{array}{r} 3 \\ -5 \\ -6 \\ 13 \\ -1 \end{array}}$$

$$\begin{array}{r} 5 \\ 5 \\ 0 \\ -10 \\ 5 \\ 3 \\ 0 \\ -6 \\ 13 \\ 3 \\ 4 \\ R \end{array}$$

$$\begin{array}{r} 3x^4 \\ x^3 \\ x^2 \\ x \\ 1 \\ 0 \\ R \end{array}$$

$$3x^4 - 5x^3 - 6x^2 + 13x - 1 = (3x-5)(x^3 - 2x + 1) + 4$$

$$\textcircled{8} \quad 4 \overline{) \begin{array}{r} 3 \\ -7 \\ -13 \\ 0 \end{array}}$$

$$\begin{array}{r} 12 \\ 20 \\ 28 \\ 3 \\ 5 \\ 7 \\ 28 \\ R \end{array}$$

$$3x^3 - 7x^2 - 13x = (x-4)(3x^2 + 5x + 7) + 28$$

$$\textcircled{9} \quad 2 \overline{) \begin{array}{r} 1 \\ 0 \\ -11 \\ 18 \\ -8 \end{array}}$$

$$\begin{array}{r} 2 \\ 2 \\ 4 \\ -14 \\ 8 \\ 1 \\ 2 \\ -7 \\ 4 \\ 0 \end{array}$$

$$p(x) = (x-2)(x^2 + 2x^2 - 7x + 4)$$

$$1 \overline{) \begin{array}{r} 2 \\ -7 \\ 4 \end{array}}$$

$$\begin{array}{r} 2 \\ 1 \\ 3 \\ -4 \\ 0 \end{array}$$

$$p(x) = (x-2)(x-1)(x^2 + 3x - 4)$$

$$p(x) = (x-2)(x-1)(x+4)(x-1)$$

$$x^4 - 11x^2 + 18x - 8 = (x-1)^2(x-2)(x+4)$$

$$\textcircled{10} \quad \frac{3}{2} \overline{) \begin{array}{r} 10 \\ -63 \\ 2 \\ 93 \\ 18 \end{array}}$$

$$\begin{array}{r} 15 \\ -72 \\ -105 \\ -18 \\ 10 \\ -48 \\ -70 \\ -12 \\ 0 \\ 5 \\ -24 \\ -35 \\ -6 \end{array}$$

$$p(x) = (2x-3)(5x^2 - 24x^2 - 35x - 6)$$

$$6 \overline{) \begin{array}{r} 5 \\ -24 \\ -35 \\ -6 \end{array}}$$

$$\begin{array}{r} 30 \\ 36 \\ 6 \\ 5 \\ 6 \\ 1 \\ 0 \end{array}$$

$$p(x) = (2x-3)(x-6)(5x^2 + 6x + 1)$$

$$p(x) = (2x-3)(x-6)(5x+1)(x+1)$$

$$10x^4 - 63x^3 + 2x^2 + 93x + 18 = (2x-3)(x-6)(5x+1)(x+1)$$

$$\textcircled{13} \quad 1 \left| \begin{array}{cccccc} 1 & 2 & -13 & -14 & 24 & \\ \downarrow & 1 & 3 & -10 & -24 & \\ \hline & 1 & 3 & -10 & -24 & 0 \end{array} \right.$$

$$p(x) = (x-1)(x^3 + 3x^2 - 10x - 24)$$

$$\begin{array}{r} -4 \left| \begin{array}{cccc} 1 & 3 & -10 & -24 \\ \downarrow & -4 & 4 & 24 \\ \hline & 1 & -1 & -6 & 0 \end{array} \right. \end{array}$$

$$p(x) = (x-1)(x+4)(x^2 - x - 6)$$

$$p(x) = (x-1)(x+4)(x-3)(x+2)$$

$$x^4 + 2x^3 - 13x^2 - 14x + 24$$

$$= (x-1)(x+4)(x-3)(x+2)$$

$$\textcircled{15} \quad -\frac{1}{3} \left| \begin{array}{ccccc} 6 & 11 & -48 & 19 & 12 \\ \downarrow & -2 & -3 & 17 & -12 \\ \hline \frac{6}{3} & \frac{9}{3} & \frac{-51}{3} & \frac{36}{3} & 0 \\ 2 & 3 & -17 & 12 & 0 \end{array} \right.$$

$$p(x) = (3x+1)(2x^3 + 3x^2 - 17x + 12)$$

$$\frac{3}{2} \left| \begin{array}{cccc} 2 & 3 & -17 & 12 \\ \downarrow & 3 & 9 & -12 \\ \hline \frac{2}{2} & \frac{6}{2} & \frac{-8}{2} & 0 \\ 1 & 3 & -4 & 0 \end{array} \right.$$

$$\frac{2}{2} \quad \frac{6}{2} \quad \frac{-8}{2} \quad 0$$

$$p(x) = (3x+1)(2x-3)(x^2 + 3x - 4)$$

$$p(x) = (3x+1)(2x-3)(x+4)(x-1)$$

$$6x^4 + 11x^3 - 48x^2 + 19x + 12$$

$$= (3x+1)(2x-3)(x+4)(x-1)$$

Answers:

$$\textcircled{10} \quad 6x^4 + 23x^3 - 16x^2 - 53x - 20 = (x+1)(x+4)(2x+1)(3x-5)$$

$$\textcircled{12} \quad 6x^4 - 17x^3 - 64x^2 - 7x + 10 = (x-5)(x+2)(2x+1)(3x-1)$$

$$\textcircled{14} \quad 36x^4 - 36x^3 - 31x^2 + 14x + 8 = (2x+1)^2(3x-4)(3x-2)$$