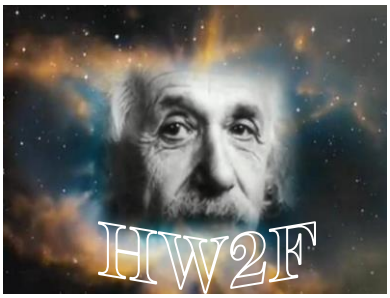
Solve the following polynomial equations by factoring or quadratic substitution.



1) $x^4 - 4x^2 - 12 = 0$

2) $x^3 + 6x^2 - 4x - 24 = 0$

3) $3x^3 - 16x^2 - 12x + 64 = 0$

4) $x^4 - 7x^2 - 8 = 0$

5) $2x^4 = -7x^2 + 15$

6) $2x^3 - x^2 - 2x + 1 = 0$

7) $x^3 + 2x^2 - 6x = 12$

8) $2x^3 - 3x^2 = 12 - 8x$

9) $10x^3 + 5x = 6x^2 + 3$

10) $2x^4 + 3x^2 - 20 = 0$

Create a list of possible rational roots using the rational root theorem (p's & q's). DO NOT SOLVE!

11) $x^4 - 5x^2 + x - 80 = 0$

12) $3x^3 - 2x + 5x + 8 = 0$

13) $10x^5 + 3x^3 + 7x^2 - 2 = 0$

Use the rational root theorem (p's & q's) to solve each equation.

14) $x^3 - x^2 - x + 1 = 0$

15) $3x^3 - 4x^2 - 5x + 2 = 0$

16) $x^4 + 2x^3 - 2x^2 - 6x - 3 = 0$

17) $3x^4 + 2x^3 - 9x^2 - 12x - 4 = 0$

18) $2x^4 - x^3 - 7x^2 + x + 2 = 0$

Factor each polynomial function, then use those factors for ***sketch*** its graph.

19) $f(x) = x^3 + 2x^2 - 9x - 18$

20) $g(x) = 4x^3 + x^2 - 18x$

21) $h(x) = x^4 - 5x^2 + 4$

22) $k(x) = -x^4 + 10x^2 - 24$

23) $j(x) = x^4 - 18x^2 + 81$

24) $f(x) = 4x^3 - 13x - 6$
(hint: you may have to find the first factor using a method other than the one you used for #19-23)

1) $\pm\sqrt{6}, \pm\sqrt{2}$
2) -6, ±2
3) ±2, 16/3
4) $\pm 2\sqrt{2}, \pm i$
5) $\pm\sqrt{6}/2, \pm i\sqrt{5}$
6) ±1, 1/2
7) -2, $\pm\sqrt{6}$
8) 3/2, ±2*i*
9) 3/5, $\pm i\sqrt{2}/2$
10) $\pm\sqrt{10}/2, \pm 2i$
11) ±1,2,4,5,8,10,16, 20,40,80
12) ±1,2,4,8,1/3,2/3, 4/3,8/3
13) ±1,2,1/2,1/5, 2/5,1/10
14) ±1
15) -1, 1/3, 2
16) -1, $\pm\sqrt{3}$
17) -1, -2/3, 2
18) -1/2, 2, $\frac{-1\pm\sqrt{5}}{2}$

See Mr. Paull for graphs

19) $(x + 3)(x - 3)(x + 2)$
20) $x(x - 2)(4x + 9)$
21) $(x - 1)(x + 1)(x - 2)(x + 2)$
22) $-(x-2)(x+2)(x-\sqrt{6})(x+\sqrt{6})$
23) $(x - 3)^2(x + 3)^2$
24) $(x - 2)(2x + 1)(2x + 3)$