

Practice 7.4

Date _____ Period _____

Factor completely by factoring out a GCF, then factoring the remaining trinomial.

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

2) $2x^4 - 12x^3 + 18x^2$
 $2x^2(x^2 - 6x + 9)$
 $2x^2(x-3)^2$ PERFECT TRINOMIAL

3) $10x^4 - 90x^2$ GCF $10x^2$
 $10x^2(x^2 - 9)$ ← DIFF OF PERFECT □'S
 $10x^2(x-3)(x+3)$

4) $x^3 - 7x^2 + 12x$
 $x(x^2 - 7x + 12)$
 $x(x-4)(x-3)$

Factor each sum of cubes.

5) $27x^3 + 125$ $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
 $a = 3x$ $b = 5$
 $(3x)^3 + 5^3 = (3x+5)((3x)^2 - (3x)(5) + 5^2)$
 $= (3x+5)(9x^2 - 15x + 25)$

6) $8x^3 + 27$
 $a = 2x$ $b = 3$
 $(2x+3)((2x)^2 - (2x)(3) + 3^2)$
 $= (2x+3)(4x^2 - 6x + 9)$

Factor each difference of cubes.

7) $8x^3 - 1$ $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
 $a = 2x$ $b = 1$
 $(2x-1)((2x)^2 + (2x)(1) + 1^2)$
 $= (2x-1)(4x^2 + 2x + 1)$

8) $27x^3 - 125$ $a = 3x$ $b = 5$
 $(3x-5)((3x)^2 + (3x)(5) + 5^2)$
 $= (3x-5)(9x^2 + 15x + 25)$

Factor each completely by grouping.

9) $x^3 + 5x^2 - 6x - 30$
 $x^2(x+5) - 6(x+5)$
 $= (x^2 - 6)(x+5)$

10) $7r^3 - 42r^2 - 3r + 18$
 $7r^2(r-6) - 3(r-6)$
 $= (7r^2 - 3)(r-6)$

11) $5n^3 + 40n^2 - n - 8$
 $5n^2(n+8) - 1(n+8)$
 $= (n+8)(5n^2 - 1)$

12) $6x^3 - x^2 - 42x + 7$
 $x^2(6x-1) - 7(6x-1)$
 $= (6x-1)(x^2 - 7)$

Factor each quadratic form polynomial completely.

13) $x^4 + 6x^2 - 16$
 $(x^2 + 8)(x^2 - 2)$

14) $m^4 - 1$
 $(x^2 + 1)(x^2 - 1)$
 $(x^2 + 1)(x-1)(x+1)$
 $(m^2 + 1)(m-1)(m+1)$

Similar to:
 $x^2 - 1$

SIMILAR TO $x^2 + 6x - 16$

WOOPS ... I USED x , NOT m

15) $5a^5 + 55a^3 + 150a$

GCF = $5a$

$5a(a^4 + 11a^2 + 30)$
 $5a(a^2 + 5)(a^2 + 6)$

$\frac{30}{5 \times 6}$
 $\frac{11}{11}$

SIMILAR TO $x^2 - 4x + 3$

16) $4x^5 - 16x^3 + 12x$

Hint: Take out a GCF!!

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

$4x(x^2 - 3)(x^2 - 1)$

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

DIFF OF P.S.

Solve for x.

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

GROUPING

$x^2(x-2) - 5(x-2) = 0$ SET = 0 & SOLVE
 $(x-2)(x^2 - 5) = 0$
 $x = 2, \pm\sqrt{5}$

19) $x(3x-5)(x-4) = 0$

EASY!

$x = 0$ OR $3x - 5 = 0$ OR $x - 4 = 0$

$x = 0$ OR $x = \frac{5}{3}$ OR $x = 4$

21) $8x^4 - 54x^2 + 81 = 0$ SIMILAR TO:

$(4x^2 - 9)(2x^2 - 9) = 0$ OR $8x^2 - 54x + 81$

$\frac{648}{-18 \times -36}$
 $\frac{81}{-54}$

$(8x - 18)(8x - 36)$
 $(4x - 9)(2x - 9)$

$4x^2 - 9 = 0$ $2x^2 - 9 = 0$
 $x^2 = \frac{9}{4}$ $x^2 = \frac{9}{2}$

$x = \pm\sqrt{\frac{9}{4}}$ $x = \pm\sqrt{\frac{9}{2}}$

$x = \pm\frac{3}{2}$ $x = \pm\frac{3\sqrt{2}}{2}$

This problem is optional. Only the Jedi Knights of factoring should attempt it.

23) $x^9 - 25x^5 + 144x = 0$

(CAN YOU GET IT?)

GCF, THEN QUAD FORM

THEN MORE QUAD FORM

PERFECT SQUARES, ETC.

$x = 0, 2, -2, \pm 2i, \pm\sqrt{3}, \pm i\sqrt{3}$

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

QUAD FORM

$(x^2 - 9)(x^2 + 2) = 0$ $\frac{-18}{-9 \times -2}$

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

$x-3=0$ OR $x+3=0$ OR $x^2+2=0$ YUK!

$x = 3$ $x = -3$ $x = \pm i\sqrt{2}$

20) $9x^4 - 30x^2 + 25 = 0$

$0 = (3x^2 - 5)(3x^2 - 5)$ SIMILAR TO $9x^2 - 30x + 25$
 $(3x-5)(3x-5)$ $\frac{225}{-15 \times -15}$
 $(9x-15)(9x-15)$ $\frac{225}{-30}$

$3x^2 - 5 = 0$

$x^2 = \frac{5}{3}$

$x = \pm\sqrt{\frac{5}{3}} = \pm\frac{\sqrt{15}}{3}$

22) $x^3 - 2x^2 + x = 0$

$x(x^2 - 2x + 1) = 0$

$x(x-1)^2 = 0$

$x = 0$ OR $x - 1 = 0$

$x = 1$