SM3 Unit1 Review Name: ___________________________

Factor completely over the set of rational numbers (**no complex factoring**).

1) $8x^3 + 8x^2 + 7x + 7$
$(8x^3 + 8x^2) + (7x + 7)$
$8x^2(x + 1) + 7(x + 1)$
$(x + 1)(8x^2 + 7)$

2) $t^2 - t - 7$
$ac = -7, no\ \#'s\ work$
Prime, cannot be factored with the integers

3) $6m^2 + 24m$
$6m(m + 4)$

4) $5w^2 - 10w - 15$
$5(w^2 - 2w - 3)$
$ac = 1(-3) = -3\ and\ 1(-3) = -3$
$and\ 1 + -3 = -2$
$5[(w^2 + 1w) + (-3w - 3)]$
$5[w(w + 1) - 3(w + 1)]$
$5(w - 3)(w + 1)$

5) $x^2 - 49$
$(x + 7)(x - 7)$

6) $125 + 64x^3$
$5^3 + (4x)^3$
$(5 + 4x)(5^2 - 5(4x) + (4x)^2)$
$(5 + 4x)(25 - 20x + 16x^2)$

7) $w^2 - w - 6$
$ac = 1(-6) = -6\ and\ 2(-3) = -6$
$and\ 2 + -3 = -1$
$(w^2 + 2w) + (-3w - 6)$
$w(w + 2) - 3(w + 2)$
$(w - 3)(w + 2)$

8) $-15x^3y^2 - 10xy^2$
$-5xy^2(3x^2 - 2)$

9) $6n^2 - 23n + 20$
$ac = 6(20) = 120$ and $8(15) = 120$ and
$-8 + -15 = -23$
$(6n^2 - 8n) + (-15n + 20)$
$2n(3n - 4) - 5(3n - 4)$
$(3n - 4)(2n - 5)$

10) $25y^2 - 64$
$(5y + 8)(5y - 8)$

11) $2b^2 - 1b + 2$
$ac = 4, no\ \#'s\ work$
Prime, cannot be factored with the integers

12) $8k^2 + 11k - 10$
$ac = 8(10) = -80$ and $-5(16) = -80$ and
$-5 + 16 = 11$
$(8k^2 - 5k) + (16k - 10)$
$k(8k - 5) + 2(8k - 5)$
$(k + 2)(8k - 5)$

13) $-2x^2 + 7x + 15$
$-1(2x^2 - 7x - 15)$
$ac = (2)(15) = -30,$
$and\ (-10)(3) = -30$
$-1[(2x^2 - 10x) + (3x - 15)]$
$-1[2x(x - 5) + 3(x - 5)]$
$-1(2x + 3)(x - 5)$

14) $6xy - 2y - 3x + 1$
$2y(3x - 1) - 1(3x - 1)$
$(2y - 1)(3x - 1)$

15) $54 - 16x^3$
$2(27 - 8x^3)$
$2(3^3 - (2x)^3)$
$2(3 - 2x)(3^2 + 3(2x) + (2x)^2)$
$2(3 - 2x)(9 + 6x + 4x^2)$

16) $4y^2 + 28y + 48$
$4(y^2 + 7y + 12)$
$ac = (1)(12) = 12,$
$and\ (4)(3) = 12$
$4[(y^2 + 4y) + (3y + 12)]$
$4[y(y + 4) + 3(y + 4)]$
$4(y + 3)(y + 4)$

17) $y^4 + y^2 - 20$
$(y^2)^2 + (y^2) - 20$
$(y^2 + 5)(y^2 - 4)$
$(y^2 + 5)(y + 2)(y - 2)$

18) $x^5 - x^3 + 8x^2 - 8$
$x^3(x^2 - 1) + 8(x^2 - 1)$
$(x^3 + 8)(x^2 - 1)$
$(x + 2)(x^2 - 2x + 4)(x + 1)(x - 1)$

19) $x^4 - 8x^2 - 9$
$(x^2)^2 - 8(x^2) - 9$
$(x^2 + 1)(x^2 - 9)$
$(x^2 + 1)(x + 3)(x - 3)$

Factor each quadratic expression completely over the set of complex numbers.

20) $12m^2 + 12$
$12(m^2 + 1)$
$12\left(m^2 - (-1)\right)$
$12(m + i)(m - i)$

21) $-4x^2 - 8$
$-4(x^2 + 2)$
$-4\left(x^2 - (-2)\right)$
$-4\left(x + i\sqrt{2}\right)\left(x - i\sqrt{2}\right)$

22) $x^2 + 4x + 5$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(5)}}{2(1)} = \frac{-4 \pm \sqrt{-4}}{2}$$

$$x = \frac{-4 \pm 2i}{2} = -2 \pm i$$

$(x + 2 + i)(x + 2 - i)$

23) $x^2 - 3x + 6$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(6)}}{2(1)} = \frac{3 \pm \sqrt{-15}}{2}$$

$$x = \frac{3 \pm i\sqrt{15}}{2}$$

$$4\left(x - \frac{3 + i\sqrt{15}}{2}\right)\left(x - \frac{3 - i\sqrt{15}}{2}\right)$$