Name: Homework Guide **Date:** _____

Find all of the linear solutions:

1. $f(x) = x^3 - 27$

$(x)^3 - (3)^3$

$(x-3)=0$

$x=3$

$x=3$

2. $f(x) = x^3 + 8$

$x=-2$

3. $f(x) = 8x^3 + 343$

$x=\frac{-7}{3}$

4. $f(x) = 32x^3 - 108$

$4[8x^3 - 27]$

$4[(2x)^3 - (3)^3]$

$2x-3=0$

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

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

Factor completely:

5. $f(x) = 64x^3 - 1$

$f(x) = (4x)^3 - (1)^3$

$f(x)=(4x-1)(16x^2+4x+1)$

6. $f(x) = x^3 + 125$

$f(x)=(x+5)(x^2+5x+25)$

7. $f(x) = 8x^3 - 27$

$f(x)=(2x-3)(4x^2-6x+9)$

8. $f(x) = 2x^3 + 250$

$f(x)=2(x^3+125)$

$f(x)=2[(x)^3+(5)^3]$

$f(x)=2(x+5)(x^2-5x+25)$

Find all of the roots:

9. $f(x) = x^3 - x^2 - 14x + 24$

$$\begin{array}{r|rrrr} -4 & 1 & -1 & -14 & +24 \\ & \downarrow & -4 & +20 & -24 \\ \hline & 1 & -5 & +6 & \mid 0 \end{array}$$

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

$x=2 \quad x=3$

Roots
1. $x=-4$
2. $x=2$
3. $x=3$

10. $f(x) = x^3 + 9x^2 + 23x + 15$

Roots
1. $x=-5$
2. $x=-3$
3. $x=-1$

11. $f(x) = x^4 - 6x^2 + 8$

Roots
1. $x=2$
2. $x=-2$
3. $x=\sqrt{2}$
4. $x=-\sqrt{2}$

12. $f(x) = x^3 - x^2 + x - 1$

$$\begin{array}{r|rrrr} 1 & 1 & -1 & +1 & -1 \\ & \downarrow & +1 & 0 & +1 \\ \hline & 1 & 0 & +1 & \mid 0 \end{array}$$

$x^2+1=0$

$\sqrt{x^2}=\sqrt{-1}$

$x=\pm i$

Roots
1. $x=1$
2. $x=i$
3. $x=-i$

13. $f(x) = 3x^3 + 4x^2 - 35x - 12$

$$\begin{array}{r|rrrr} -4 & 3 & +4 & -35 & -12 \\ & \downarrow & -12 & +32 & +12 \\ \hline & 3 & -8 & -3 & \mid 0 \end{array}$$

$3x^2-8x-3=0$

$(3x+1)(x-3)=0$

$x=-\frac{1}{3} \quad x=3$

Roots
1. $x=-4$
2. $x=3$
3. $x=-\frac{1}{3}$

14. $f(x) = 5x^4 - 46x^3 + 84x^2 - 50x + 7$

Roots
1. $x=1$
2. $x=1$
3. $x=7$
4. $x=\frac{1}{5}$

15. $f(x) = x^4 - 4x^3 + 4x - 1$

Roots
1. $x=-1$
2. $x=1$
3. $x=2+\sqrt{3}$
4. $x=2-\sqrt{3}$

16. $f(x) = 2x^5 - 4x^4 - 2x^3 + 28x^2$

$f(x)=x^2(2x^3-4x^2-2x+28)$

$x=0,0$

$$\begin{array}{r|rrrr} -2 & 2 & -4 & -2 & +28 \\ & \downarrow & -4 & +16 & -28 \\ \hline & 2 & -8 & +14 & \mid 0 \end{array}$$

$2x^2-8x+14=0$

$2(x^2-4x+7)=0$

$x^2-4x+4=-7+4$

$\sqrt{(x-2)^2}=\sqrt{-3}$

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

Roots
1. $x=0$
2. $x=0$
3. $x=-2$
4. $x=2+i\sqrt{3}$
5. $x=2-i\sqrt{3}$