Name: AK

Algebra II Honors - 3.3 Practice

1. Given: $f(x) = -8x^3 - 32x^2 - 42x - 18$

a) If (x+1) is a factor, find all zeros.

$$\begin{array}{r|rrrr} -1 & -8 & -32 & -42 & -18 \\ & \downarrow & 8 & 24 & 18 \\ \hline & -8 & -24 & -18 & 0 \end{array}$$

$-(x+1)(8x^2+24+18)$

$-2(x+1)(4x^2+12x+9)$

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

$x = -1, -3/2, -3/2$

b) Find the quotient of f(x) and (x-1). Verify the remainder is correct.

~~$8x^2 - 24x - 18$~~

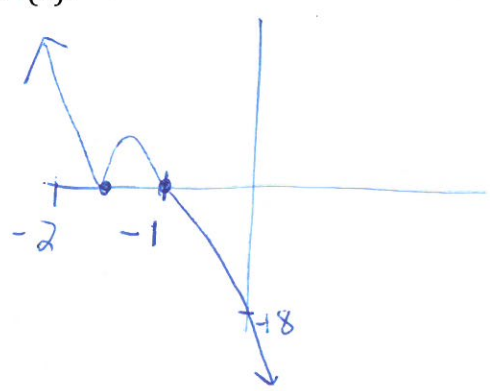
$$\begin{array}{r|rrrr} 1 & -8 & -32 & -42 & -18 \\ & \downarrow & -8 & -40 & -82 \\ \hline & -8 & -40 & -82 & -100 \end{array}$$

Verify $= F(1) = -8(1)^3 - 32(1)^2 - 42(1) - 18 = -100$ ✓

c) Write f(x) as: d(x)q(x) + r(x)

$-8x^3 - 32x^2 - 42x - 18 = (-8x^2 - 24x - 18)(x+1) + 0$

d) Sketch f(x).



2. Find $f(\sqrt{2})$, given $f(x) = x^4 - 3x^3 + x - 1$, using synthetic division.

$$\begin{array}{r|rrrrr} \sqrt{2} & 1 & -3 & 0 & 1 & -1 \\ & \downarrow & \sqrt{2} & -3\sqrt{2}+2 & -6+2\sqrt{2} & -5\sqrt{2}+4 \\ \hline & 1 & -3+\sqrt{2} & -3\sqrt{2}+2 & -5+2\sqrt{2} & -5\sqrt{2}+3 \end{array}$$

3. Divide using long division. $\dfrac{x^4+9x^3-5x^2-36x+4}{x^2-4}$. $= x^2+9x-1$

$$
\begin{array}{r|l}
 & x^2+9x-1 \\
x^2-4 & x^4+9x^3-5x^2-36x+4 \\
 & -(x^4 \qquad -4x^2) \\
 & 9x^3-x^2-36x+4 \\
 & -(9x^3 \qquad -36x) \\
 & -x^2+4 \\
 & -x^2+4 \quad 0
\end{array}
$$

Explain why and how synthetic division could be used to divide the above.

BC you can only do synthetic division when dividing by a linear polynomial.

4. ~~Divide:~~ $\dfrac{x^{3n}-3x^{2n}+5x^n-6}{x^n-2}$

$$
\begin{array}{r|l}
 & x^{2n}-x^n+3 \\
x^n-2 & x^{3n}-3x^{2n}+5x^n-6 \\
 & -(x^{3n}-2x^{2n}) \\
 & -x^{2n}+5x^n-6 \\
 & -(-x^{2n}+2x^n) \\
 & 3x^n-6 \\
 & 3x^n-6 \quad 0
\end{array}
$$

$$
\begin{array}{r|l}
 & x^{2n}+x^n+7+\frac{8}{x^n-2} \\
x^n-2 & x^{3n}-3x^{2n}+5x^n-6 \\
 & -(x^{3n}-2x^{2n}) \\
 & x^{2n}+5x^n-6 \\
 & -(x^{2n}-2x^n) \\
 & 7x^n-6 \\
 & -(7x^n-14) \\
 & 8
\end{array}
$$

5. Given: $f(x)=x^4-4x^3+13x^2-36x+36$.

a) If "2" is a double zero, find all other zeros and factor f(x).

2	1	-4	13	-36	36
		2	-4	18	-36
2	1	-2	9	-18	0
		2	0	18	
	1	0	9		

$(x-2)(x-2)(x^2+9)$

$(x-2)(x-2)(x+\sqrt{3}i)(x-\sqrt{3}i)$

b) Sketch f(x).