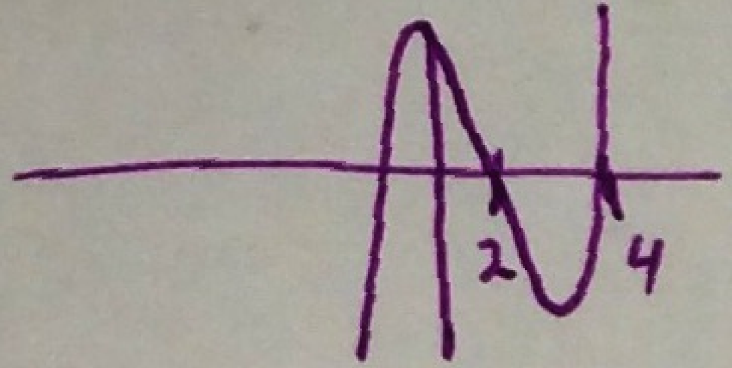
#5D Pre-Calculus Worksheet
Section 2.5 - Zeros of Polynomial Functions

Name: Key

Determine the EXACT VALUES of the zeros of each polynomial. SHOW ALL WORK (Calculator Allowed)

1. $f(x) = 13x^3 - 76x^2 + 92x + 16$

① Graph



$$\begin{array}{r|rrr|r} 2 & 13x^3 & -76 & 92 & 16 \\ & & 26 & -100 & -16 \\ \hline 4 & 13x^2 & -50 & -8 & 0 ✓ \\ & & 52 & 8 & \\ \hline & 13x & 2 & 0 & \end{array}$$

$13x + 2 = 0$

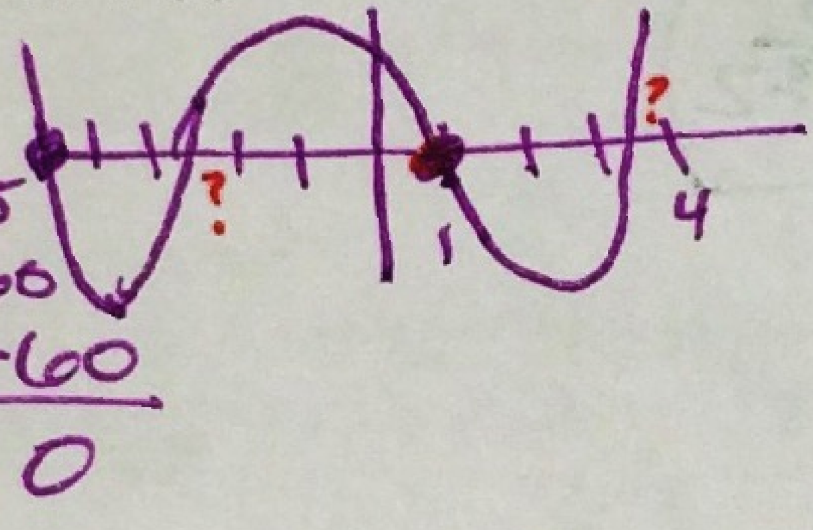
$\boxed{x = \frac{-2}{13}}$

$\boxed{\text{Zeros: } 2, 4, \frac{-2}{13}}$

2. $f(x) = 7x^3 + 25x^2 + 16x - 12$

$\boxed{\text{Zeros: } -2, \frac{3}{7}}$

3. $f(x) = x^4 + 4x^3 - 17x^2 - 48x + 60$



$$\begin{array}{r|rrrr|r} -5 & 1x^4 & 4 & -17 & -48 & 60 \\ & & -5 & 5 & 60 & -60 \\ \hline 1 & 1x^3 & -1 & -12 & 12 & 0 \\ & & 1 & 0 & -12 & \\ \hline & 1x^2 & 0 & -12 & 0 & \end{array}$$

$1x^2 - 12 = 0$

$x^2 = 12$

$x = \pm\sqrt{12}$

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

$\boxed{\text{Zeros: } -5, 1, \pm 2\sqrt{3}}$

4. $f(x) = 3x^5 - x^4 - 13x^3 + 7x^2 + 14x - 10$

* Must zoom in! and
* must use $\frac{P}{q}$ to help find a Fractional Root.

not giving it away

Zeros: $1, \underline{\ ?\ }, \pm\sqrt{2}$

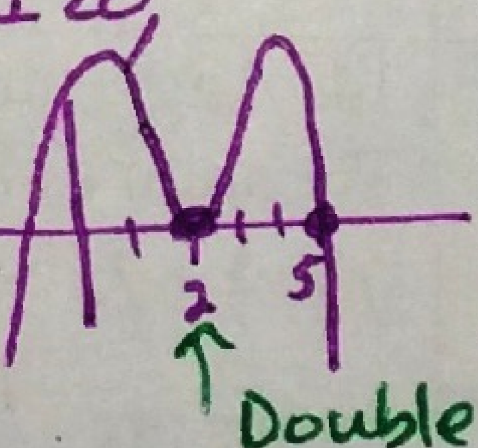
List ALL POSSIBLE Rational Roots, then determine which, if any, are zeroes.

5. $f(x) = -4x^4 + 35x^3 - 87x^2 + 56x + 20$

Possible Rational Roots:

$\frac{\pm 20}{\pm 4}: \frac{1, 2, 4, 5, 10, 20}{1, 2, 4}$: $\pm 1, \pm\frac{1}{2}, \pm\frac{1}{4}, \pm 2, \pm 4, \pm 5, \pm\frac{5}{2}, \pm\frac{5}{4}, \pm 10, \pm 20$

Roots



$$\begin{array}{r|rrrr|r} 2 & -4 & 35 & -87 & 56 & 20 \\ & & -8 & 54 & -66 & -20 \\ \hline 2 & -4 & 27 & -33 & -10 & 0 \\ & & -8 & 38 & 10 & \\ \hline 5 & -4 & 19 & 5 & 0 & \\ & & -20 & -5 & & \\ \hline & -4 & -1 & & & \end{array}$$

← I could use Quad. Formula here, but I know Root so easier.

$-4x - 1 = 0 \quad x = \frac{-1}{4}$

$\boxed{\text{Zeros } 2, 5, -\frac{1}{4}}$

6. $f(x) = 6x^4 + 13x^3 - 67x^2 + 156x - 60$

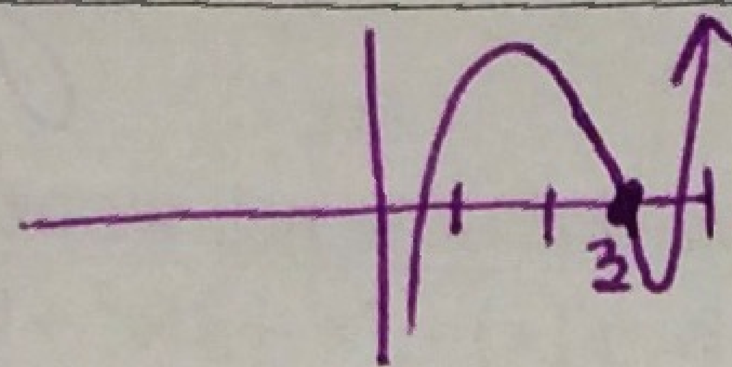
Possible Rational Roots:

Roots

OMIT

Find ALL Roots

7. $f(x) = x^3 - 7x^2 + 13x - 3$



$$\begin{array}{r|rrr|r} 3 & 1x^3 & -7 & 13 & -3 \\ & & 3 & -12 & 3 \\ \hline & 1x^2 & -4 & 1 & 0 \end{array}$$

A B C

Do not know any more roots... must use Quad.

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

$x = \dfrac{4 \pm \sqrt{12}}{2} = \dfrac{4 \pm 2\sqrt{3}}{2} = 2 \pm \sqrt{3}$

$\boxed{\text{Zeros: } 3,\ 2 \pm \sqrt{3}}$

8. $f(x) = 2x^5 + 15x^4 + 14x^3 - 87x^2 - 126x + 80$

Omit

9. Divide using LONG DIVISION:

$\dfrac{8x^8 - 3x^4 - 12x^2 + 3}{x^2 - 2}$

$\boxed{8x^6 + 16x^4 + 29x^2 + 46 + \frac{95}{x^2 - 2}}$

$x^2 - 2 \,\overline{)\, 8x^8 + 0x^6 - 3x^4 - 12x^2 + 3}$

$-8x^8 + 16x^6$

$16x^6 - 3x^4$

$-16x^6 + 32x^4$

$29x^4 - 12x^2$

$-29x^4 + 58x^2$

$46x^2 + 3$

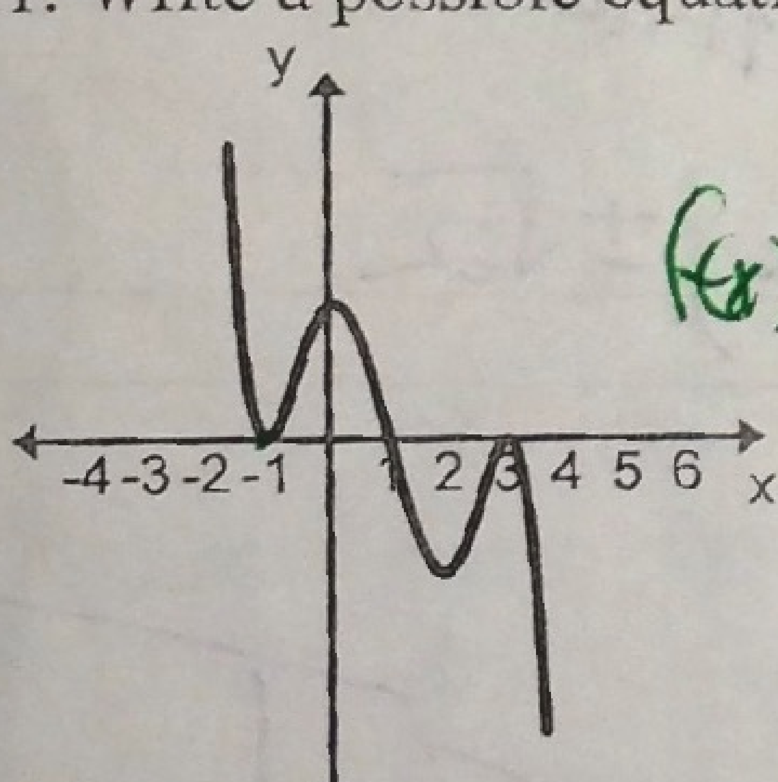
$-46x^2 + 92$

95

10. Sketch a possible graph:

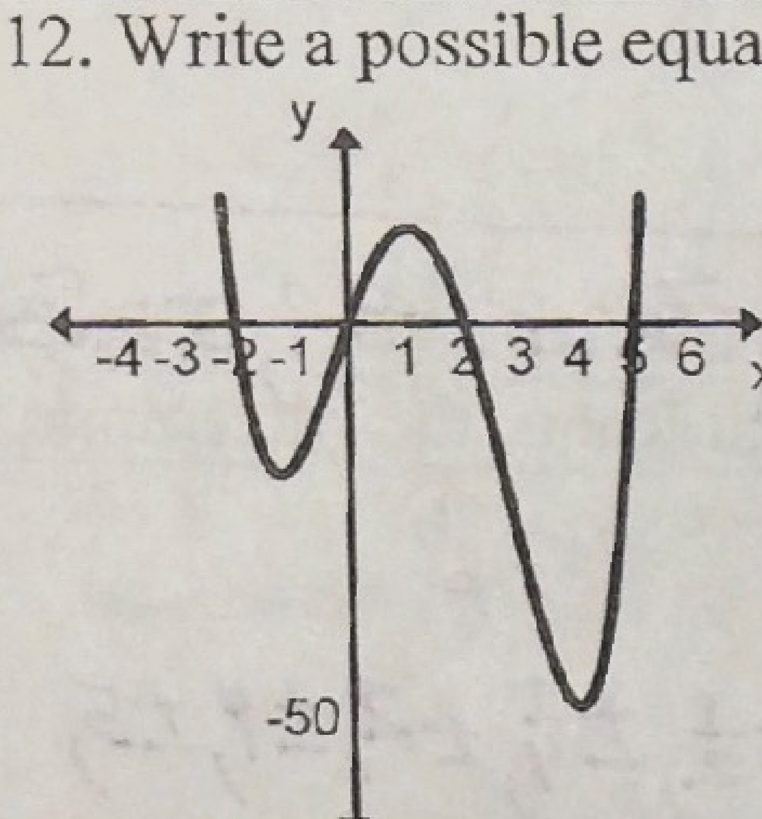
$f(x) = -3x^2(x-4)(x+3)^3$

11. Write a possible equation in factored form.

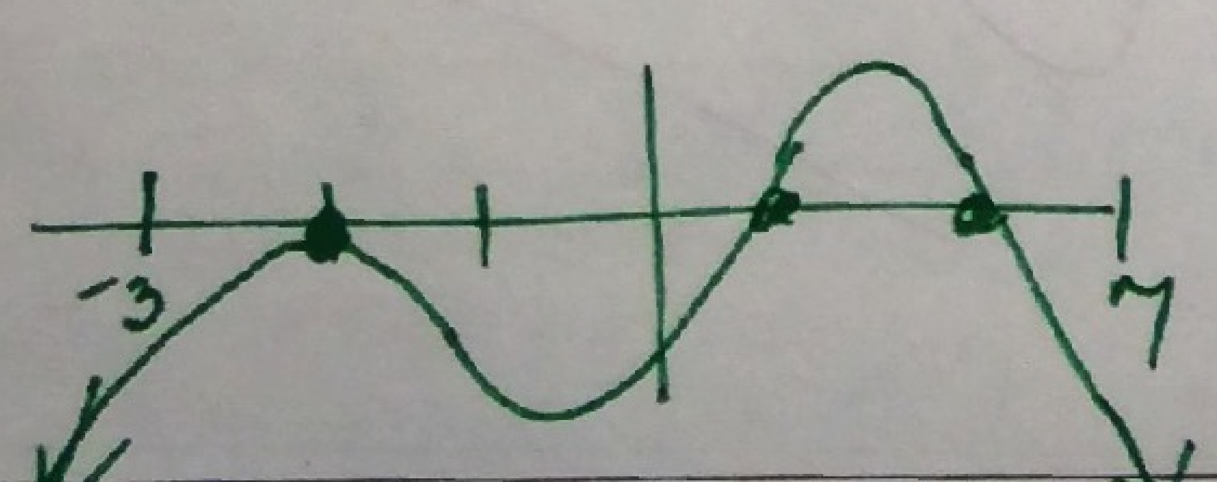


$f(x) = -(x+1)^2(x-1)(x-3)^2$

12. Write a possible equation in factored form.



13. Sketch a possible graph of a 4^{th} degree polynomial and a negative leading coefficient. The polynomial has one negative real zero greater than -3 and with a multiplicity of 2. The polynomial also has two distinct positive real zeros less than 7.



14. Angie and Julius are using the Rational Zeroes Theorem to find all possible rational zeroes of $f(x) = 7x^2 + 2x^3 - 5x - 3$. Julius thinks the possible zeroes are $\pm\frac{1}{7}, \pm\frac{3}{7}, \pm 1, \pm 3$. Angie thinks they are $\pm\frac{1}{2}, \pm\frac{3}{2}, \pm 1, \pm 3$. Is either of them correct? Explain your reasoning.