Math Course Date Sample HW Name #1/2

I need to factor $f(x) = x^5 + x^4 - 10x^3 + 8x^2$ and find multiplicities of the zeros.

Factor out x^2 to get: $f(x) = x^2(x^3 + x^2 - 10x + 8)$

Note: I guessed that $x=1$ is a root using my calculator, so I will divide by $x-1$.

$$
\begin{array}{r l}
 & \phantom{x^3+{}} x^2 + 2x - 8 \\
x-1 & \overline{\big) x^3 + x^2 - 10x + 8} \\
 & -(x^3 - x^2) \\
 & 2x^2 - 10x \\
 & -(2x^2 - 2x) \\
 & -8x + 8 \\
 & -(-8x + 8) \\
 & 0
\end{array}
$$

I used the quadratic formula to factor this.

Thus, $f(x) = x^2(x-1)(x^2+2x-8) = \underbrace{x^2(x-1)(x-2)(x+4)}_{\text{ANSWER}}$

So, the zeros are:

zero	-4	0	1	2
multiplicity	1	2	1	1

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Math Course Date Sample HW Name #2/2

a) For every year, we triple the population.

So, $P(t) = \underbrace{120}_{\substack{\text{initial} \\ \text{population}}} \cdot \underbrace{3 \cdot 3 \cdot 3 \cdot \cdots \cdot 3}_{\substack{t \text{ 3's after} \\ t \text{ years}}} = 120 \cdot 3^t$.

b) After four years, we have a 3-fold increase four times:

$P(1) = 120 \cdot 3$, $P(2) = 120 \cdot 3 \cdot 3$,

$P(3) = 120 \cdot 3 \cdot 3 \cdot 3$, $P(4) = 120 \cdot 3 \cdot 3 \cdot 3 \cdot 3$
$= 9720$.

Each year we triple the previous year.

c) We need to find t so that $5000 = 120 \cdot 3^t = P(t)$.

$5000 = 120 \cdot 3^t$ ← divide by 120

so, $5000/120 = 3^t$ ← apply $\log_3$ to both sides.

so, $\log_3 (5000/120) = t$.

The answer is $t = \log_3 (5000/120) \approx 3.394\cancel{92}$ years.

Full credit!!