The Factor Theorem

Use the factor theorem to fully factor

$$P(x) = x^3 - x^2 - 5x - 3$$

Testing $P(x)$ at -1, 1, -7, and 7 you find that $(-1)^3 - (-1)^2 - 5(-1) - 3 = 0$

So, $x = -1$ is a root of the polynomial.

Further, $(x + 1)$ is a factor of $(x^3 - x^2 - 5x - 3)$.

	x^2	$-2x$	-3	
x	x^3	$-2x^2$	$-3x$	
$+1$	x^2	$-2x$	-3	Remainder 0

$$= x^2 - 2x - 3 \; Remainder \; 0$$

Then, factor the quadratic:

	x	-3	
x	x^2	$-3x$	
$+1$	$1x$	-3	Remainder 0

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

Finally, find the y-intercept and sketch the function.

Factor these polynomials fully and sketch them.

- Identify all the possible integral roots of $P(x)$
- Evaluate at each possible integral value to
- Determine an integral root 'a' of $P(x)$.
- Divide $P(x)$ by $(x - a)$ and show that $P(a) = 0$
- Factor the resulting quadratic and write $P(x)$ in fully factored form.
- Sketch the polynomial.

1. $P(x) = x^3 - 2x^2 - 5x + 6$

2. $P(x) = x^3 + 4x^2 - 11x - 30$

3. $P(x) = x^3 - 3x^2 - 22x + 24$

4. $P(x) = x^3 - 8x^2 + 5x + 14$

5. $P(x) = x^3 + 5x^2 - 18x - 72$

6. $P(x) = x^3 + x^2 - 37x + 35$

7. $P(x) = x^3 + 3x^2 - 34x + 48$

8. $P(x) = x^3 - 3x^2 - 46x - 72$

9. $P(x) = x^3 - 2x^2 - 43x - 40$

10. $P(x) = x^3 - 7x^2 - 6x + 72$

11. $P(x) = x^3 + 2x^2 - 53x + 90$

12. $P(x) = x^3 + x^2 - 44x - 84$

13. $P(x) = x^3 + 8x^2 - 5x - 84$

14. $P(x) = x^3 - 4x^2 - 37x + 40$

15. $P(x) = 3x^3 + 0x^2 - 12x - 0$