

Final Review – Part 3

1. Try to define the following words without looking in your notes.

Roots – Values that make a polynomial equal 0.  
On a graph, they are the x-intercepts.

Multiplicity – The exponent of a factor of a polynomial.

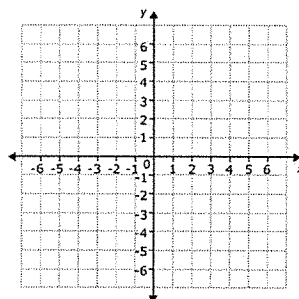
Asymptote – A line that gets closer and closer to a function but doesn't touch it.

Constant – The coefficient of  $x^0$  in a polynomial.

2. Simplify the rational function  $f(x) = \frac{2x^3 + 4x^2 + 2x}{x^3 - x}$ . Then state the domain and graph.

$$f(x) = \frac{2(x+1)}{x-1}$$

$$\text{Domain: } \{x \in \mathbb{R} \mid x \neq 0, 1, -1\}$$



3. Do all lines have roots? Explain.

No... consider  $y=3$ . This is a line but it never equals 0. (It never crosses the x-axis.)

4. Let  $f(x) = \frac{P(x)}{Q(x)}$  where  $P(x)$  and  $Q(x)$  are both linear polynomials. If  $P(n) = Q(n)$ , is it possible for  $f$  to have a vertical asymptote at  $x = n$ ? Explain.

No. To have a vertical asymptote at  $x=n$  we would need  $Q(n)=0$ . But then, since  $P(n)=Q(n)=0$  (which cancels the 0 in the denominator) we would just have a hole at  $x=n$ .

Simplify each expression.

$$5. \left(\frac{x^{-2}y}{x^2}\right)^{-1} = \left(\frac{y}{x^4}\right)^{-1} = \frac{x^4}{y}$$

$$6. (2x-1)^2$$

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

$$= 4x^2 - 4x + 1$$