Section 2A Polynomials College Review Math

POLYNOMIAL FUNCTION… YES OR NO??

and TRY NAMING IT!

1) $f(x)=\frac{1}{3}x-7$ (Y) N

linear

2) $f(x)=x^2-11x+28$ (Y) N

quadratic

3) $g(x)=\frac{4x^2-25}{6x+15}$ Y (N)

rational

4) $k(x)=x^3-16x$ (Y) N

cubic

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

quartic

6) $g(x)=2+x^{-2}$ Y (N)

rational

7) $f(x)=x^5+3x^4-3x^3-9x^2-4x-12$ (Y) N

quintic

8) $h(x)=12.5$ (Y) N

constant

POLYNOMIAL FUNCTIONS… FINDING THEIR ZEROS

Hey, this will be fun, let's go back and find the zeros for each problem you answered yes or no to (even if they weren't functions in the first place)!

1) $f(x) = \frac{1}{3}x - 7$

0 = 1/3x – 7

7 = 1/3x

21 = x The zero is 21.

2) $f(x) = x^2 - 11x + 28$

0 = x^2 – 11x + 28*

0 = (x – 7)(x – 4)

x = 7 and x = 4

The zeros are 4 and 7

* run quadratic formula program if available.

3) $0 = \frac{4x^2 - 25}{6x + 15}$ multiply both sides by 6x + 15

0 = $4x^2$ – 25

0 = (2x – 5)(2x + 5)

x = 5/2 and x = -5/2

The zeros are ±5/2

4) $0 = x^3 - 16x$

0 = x(x^2 – 16) GCF!!

0 = x(x – 4)(x + 4)

x = 0, 4, and -4

The zeros are 0 and ±4

5) $0 = x^4 - 2x^3 + x - 2$

0 = x^3(x – 2) + 1(x – 2) factor by grouping

0 = (x – 2)(x^3 + 1)

0 = (x – 2)(x + 1)(x^2 – 1x + 1) perfect cube

x = 2, -1, run program to get x = 0.5 ± 0.9i*

The zeros are 0.5 ± 0.9i, -1 and 2

*the alternate to running the program would be to do the quadratic formula by hand

6) $0 = 2 + x^{-2}$

$0 = 2 + \frac{1}{x^2}$

$-2 = \frac{1}{x^2}$

$-2x^2 = 1$

$x^2 = -\frac{1}{2}$

$\sqrt{x^2} = \sqrt{-\frac{1}{2}}$

$x = \pm\frac{i}{\sqrt{2}} \bullet \frac{\sqrt{2}}{\sqrt{2}}$

$x = \pm\frac{i\sqrt{2}}{2}$

7) $0 = x^5 + 3x^4 - 3x^3 - 9x^2 - 4x - 12$

rational zero theorem (p's and q's)

p: ±1,2,3,4,6,12 q: ±1

p/q: ±1,2,3,4,6,12

-3	1	3	-3	-9	-4	-12
		-3	0	9	0	12
2	1	0	-3	0	-4	0
		2	4	2	4	
	1	2	1	2	0	

reinsert the variable

$1x^3 + 2x^2 + 1x + 2 = 0$

$x^2(x + 2) + 1(x + 2) = 0$

$(x + 2)(x^2 + 1) = 0$

x = -2, run program

The zeros are -3, -2, 2, ±i

8) $h(x) = 12.5$

$0 = 12.5$

Since the equation shows a false statement (0 ≠ 12.5), and there is literally no "x" to solve for, there are ***no zeros*** for this constant function.

POLYNOMIAL FUNCTIONS… FINDING VALUES OF FUNCTIONS

Use the function: $f(x) = 3x^2 - 5x$ to find…

1) f(-3)

f(-3) = $3(-3)^2 - 5(-3)$
= 3(9) + 15
= 27 + 15
f(-3) = 42

2) f(2i)

f(2i) = $3(2i)^2 - 5(2i)$
= $3(4i^2) - 10i$
= 3(-4) – 10i
f(2i) = -12 – 10i

3) f(n – 1)

f(n-1) = $3(n-1)^2 - 5(n-1)$
= 3(n – 1)(n – 1) – 5(n – 1)
= $3(n^2 - 2n + 1) - 5(n - 1)$
= $3n^2 - 6n + 3 - 5n + 5$
f(n – 1) = $3n^2 - 11n + 8$

4) f($3\sqrt{2}$)

f($3\sqrt{2}$) = $3(3\sqrt{2})^2 - 5(3\sqrt{2})$
= $3(9\sqrt{4}) - 15\sqrt{2}$
= $3(18) - 15\sqrt{2}$
f($3\sqrt{2}$) = $54 - 15\sqrt{2}$

5) f($1 + i\sqrt{5}$)

f($1+i\sqrt{5}$) = $3(1+i\sqrt{5})^2 - 5(1+i\sqrt{5})$
= $3(1 + i\sqrt{5})(1 + i\sqrt{5}) - 5(1+i\sqrt{5})$
= $3(1 + 2i\sqrt{5} + i^2\sqrt{25}) - 5(1+i\sqrt{5})$
= $3(1 + 2i\sqrt{5} - 5) - 5(1+i\sqrt{5})$
= $3 + 6i\sqrt{5} - 15 - 5 - 5i\sqrt{5}$
f($1 + i\sqrt{5}$) = $-17 + i\sqrt{5}$

POLYNOMIAL FUNCTIONS… USING SYNTHETIC SUBSTITUTION

If $P(x) = -2x^5 + 7x^4 + x^3 - 9x^2 - 17$, use synthetic substitution to find:

1) P(3)

3	-2	7	1	-9	0	-17
		-6	3	12	9	27
	-2	1	4	3	9	10

P(3) = 10

2) P(-2)

-2	-2	7	1	-9	0	-17
		4	-22	42	-66	132
	-2	11	-21	33	-66	115

P(3) = 115

3) P(1/2)

.5	-2	7	1	-9	0	-17
		-1	3	2	-3.5	-1.75
	-2	6	4	-7	-3.5	-18.75

P(0.5) = -18.75

4) P(i)

i	-2	7	1	-9	0	-17
		-2i	(7i+2)	(-7+3i)	(-16i-3)	(16-3i)
	-2	(7-2i)	(7i+3)	(-16+3i)	(-16i-3)	-1-3i

P(i) = -1 – 3i