Honors PreCalculus Name Key

Polynomial Practice

Topics discussed:

- End behavior of even/odd degree polynomial functions
- Domain/Range of polynomial functions
- Y-intercept of polynomial functions
- Amount of turning points in the graph related to the degree
- Finding all possible zeros
- Finding possible positive/negative real zeros
- Finding exact zeros
- Factoring completely
- Finding solution intervals of polynomial inequalities.

1. Identify the end behavior of the following function

$$f(x) = -x^2 + 2x - 5$$

even neg ↓ ↓

A. $x \to -\infty, f(x) \to -\infty;\ x \to \infty, f(x) \to \infty$
B. $x \to -\infty, f(x) \to \infty;\ x \to \infty, f(x) \to -\infty$
C. $x \to -\infty, f(x) \to \infty;\ x \to \infty, f(x) \to \infty$
(D.) $x \to -\infty, f(x) \to -\infty;\ x \to \infty, f(x) \to -\infty$

2. Identify the end behavior of the following function

$$g(x) = x^5 + 2x^4 - 3x + 1$$

odd pos ↓ ↑

(A.) $x \to -\infty, g(x) \to -\infty;\ x \to \infty, g(x) \to \infty$
B. $x \to -\infty, g(x) \to \infty;\ x \to \infty, g(x) \to -\infty$
C. $x \to -\infty, g(x) \to \infty;\ x \to \infty, g(x) \to \infty$
D. $x \to -\infty, g(x) \to -\infty;\ x \to \infty, g(x) \to -\infty$

3. State the end behavior of the following function:

$$h(x) = -x^3 + 2x^2 - 5x - 7$$

odd neg ↑ ↓

as $x \to -\infty$, $h(x) \to \infty$
as $x \to \infty$, $h(x) \to -\infty$

4. State the end behavior of the following function:

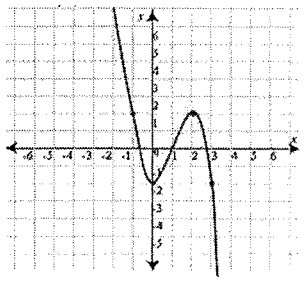
$$k(x) = x^4 + 2x^2 - 8$$

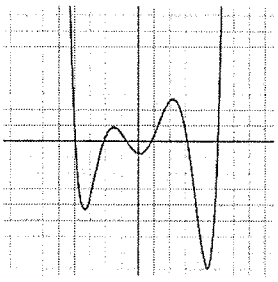
even pos ↑ ↑

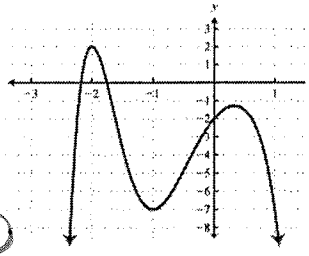
as $x \to -\infty$, $K(x) \to \infty$
as $x \to \infty$, $K(x) \to \infty$

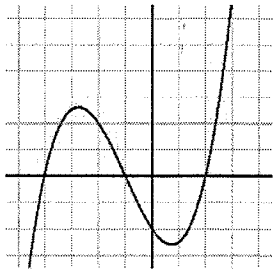
5. Identify a possible graph of the following function: $f(x) = -x^4 - 3x^3 + 2x - 2$

neg LC even deg ↓ ↓
y int -2
max of 3 turning pts

A. 

B. 

(C.) 

D. 

6. What is the maximum possible number of zeros and maximum possible number of turning points for the function $g(x) = x^5 + 2x^3 - 6x + 7$

A. Zeros= 5; turning points = 5
B. Zeros= 4; turning points = 5
(C.) Zeros= 5; turning points = 4
D. Zeros= 5; turning points = 6

5 zeros
4 turning

7. How do you determine the number of zeros and the maximum number of turning points of a function?

The number of zeros will be the same as the degree (include multiplicity and imaginary zeros). The maximum number of turning points is one less than the degree.

17. Find all zeros: $g(x) = x^3 - 4x^2 + 4x - 1$

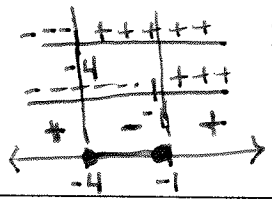
1 | 1 −4 4 −1
1 −3 1
1 −3 1 0

$x = \frac{3 \pm \sqrt{9-4(1)(1)}}{2} = \frac{3 \pm \sqrt{5}}{2}$

$x = \left\{1, \frac{3 \pm \sqrt{5}}{2}\right\}$

18. Which intervals are part of the solution to this inequality? $x^2 + 5x + 4 \le 0$ $(x+4)(x+1) \le 0$

A. $(-\infty, -4] \cup [-1, \infty)$
B. $(-4, -1)$
C. $[-1, \infty)$
D. $[-4, -1]$



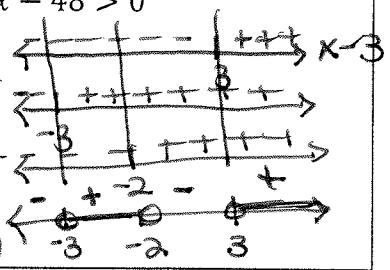
19. Solve: $x^3 + 7x^2 - 14x - 48 > 0$

3 | 1 7 −14 −48
3 30 48
1 10 16 0

$(x+8)(x+2)$

$x = -3 \quad x = -2$

$(-3, -2) \cup (3, \infty)$



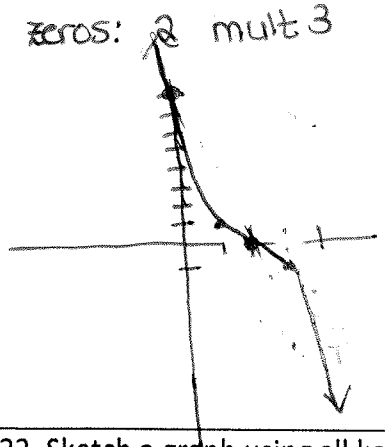
20. Sketch a graph using all key features. (Make the graph as accurate as possible.)

$f(x) = -x^3 + 6x^2 - 12x + 8$

odd ↑ ↓ neg

y int 8

zeros: 2 mult 3



4 | −1 6 −12 8
−4 −8 −80
−1 2 −20 −72

−4 | −1 6 −12 8
4 −40 208
−1 10 −52 216

2 | −1 6 −12 8
−2 8 −8
−1 4 −4 0

$-x^2 + 4x - 4 = 0$

$-(x^2 - 4x + 4) = 0$

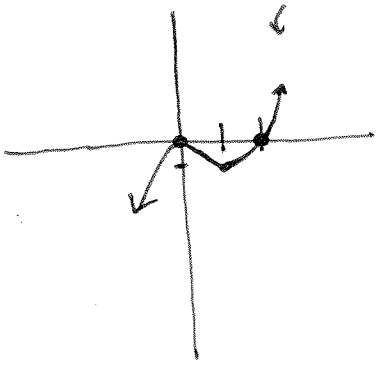
$-(x-2)^2 = 0$

21. Sketch a graph using all key features. (Make the graph as accurate as possible.)

$g(x) = x^3 - 2x^2$

$x^2(x-2)$

0 mult 2
2



1 | −1 6 −12 8
−1 5 −7
−1 5 −7 1

3 | −1 6 −12 8
−3 9 −9
−1 3 −3 −1

$g(1) = 1 - 2 = -1$

22. Sketch a graph using all key features. (Make the graph as accurate as possible.)

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

$= x^3(x+1) - 4x(x+1)$

$= (x^3 - 4x)(x+1)$

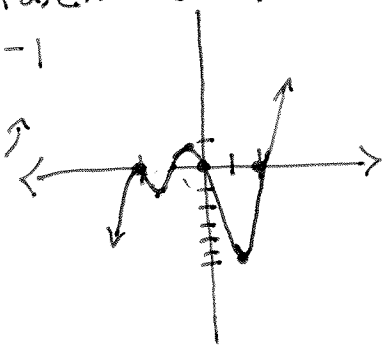
$x(x^2-4)(x+1)$

$x(x+2)(x-2)(x+1)$

zeros: $0, -2, 2, -1$

y-int: 0

end behavior ↗ ↙



1 | 1 1 −4 −4 0
1 2 −2 −6
1 2 −2 −6 −6

$-\frac{1}{2}$ | 1 $\frac{1}{2}$ −4 −4 0
$-\frac{1}{2}$ $-\frac{1}{4}$ $\frac{17}{8}$ $\frac{15}{16}$
1 $\frac{1}{2}$ $-\frac{17}{4}$ $-\frac{15}{8}$ $\frac{15}{16}$

−1.5 | 1 1 −4 −4 0
−1.5 .75 4.875 −1.3125
1 −.5 −3.25 .875 −1.3125

$-\frac{15}{16}$

23. Sketch a graph using all key features. (Make the graph as accurate as possible.)

end behavior ↑ ↗

y: int −3

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

$x = \frac{4 \pm \sqrt{16-4(2)(-3)}}{4}$

$= \frac{4 \pm \sqrt{40}}{4}$

$= \frac{4 \pm 2\sqrt{10}}{4} \approx$ 2.6 or −0.58

1 | 2 −4 −3
2 −2
2 −2 −5