

The majority of the content on this test is non-calculator, with the exception of #14-17.

Factor each polynomial completely. You do not need to solve for x.

1)  $64x^3 - 27$   
 $(4x-3)(16x^2+12x+9)$

2)  $10x^3 + 12x^2 + 2x$   
 $2x(5x^2+6x+1)$   
 $2x(x+\frac{5}{5})(x+\frac{1}{5})$   
 $2x(x+1)(5x+1)$

3)  $4x^3 - 100x^2$   
 $4x^2(x-25)$

Finding Solutions by Factoring

For each equation below, find all real solutions by factoring and solving for x:

4)  $5x^3 - 20x = 0$   
 $5x(x^2 - 4) = 0$   
 $x=0 \quad x=\pm 2$

5)  $3x^3 + 15x^2 = 72x$   
 $3x^3 + 15x^2 - 72x = 0$   
 $3x(x^2 + 5x - 24) = 0$   
 $3x(x+8)(x-3) = 0$   
 $x=0, -8, 3$

6)  $35x^2 + 15x - 20 = 0$   
 $5(7x^2 + 3x - 4) = 0$   
 $5(x+\frac{7}{7})(x-\frac{4}{7}) = 0$   
 $x=-1 \quad x=4/7$

Convert each function from factored form to standard form. Rewrite each polynomial function in standard form.

7)  $y = (x-1)(x+2)^2$   
 $(x-1)(x^2+4x+4)$   
 $x^3+4x^2+4x-x^2-4x-4$   
 $x^3+3x^2-4$

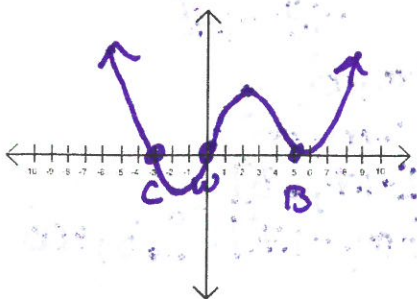
8)  $y = (x-1)^2(x-3)$   
 $(x^2-2x+1)(x-3)$   
 $x^3-2x^2+x-3x^2+6x-3$   
 $x^3-5x^2+7x-3$

9)  $y = -x(x+3)^2$   
 $-x(x^2+6x+9)$   
 $-x^3-6x^2-9x$

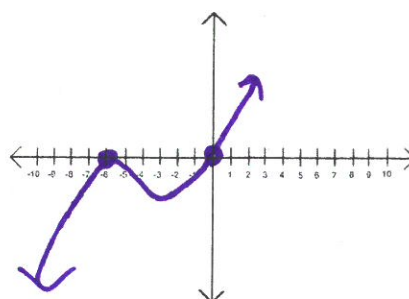
Sketching Polynomials

Sketch the graph of each polynomial to clearly show the end behavior and behavior at each root. Do NOT worry about accurately showing the location of the local maximums or minimums.

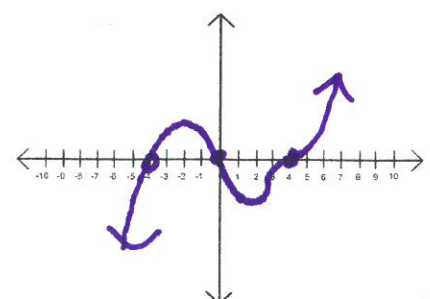
10)  $f(x) = x^3(x+3)(x-5)^2$   
 x-intercepts: 0, -3, 5  
 Degree: 6  
 LC: 1  
 End Behavior: ↖ ↗



11)  $f(x) = 4x(x+6)^2$   
 x-intercepts: 0, -6  
 Degree: 3  
 LC: 4  
 End Behavior: ↖ ↗



12)  $f(x) = 2x(x+4)(x-4)^3$   
 x-intercepts: 0, -4, 4  
 Degree: 5  
 LC: 2  
 End Behavior: ↖ ↗

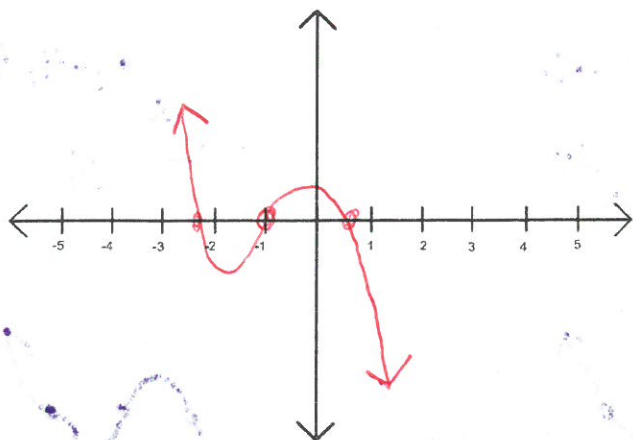


**Knowledge of Polynomial Graphs**

13) Provide the information requested for each polynomial function:

- a)  $y = -11x^7 - 6x^4 - 7x^2 + 7$  the leading coefficient – positive negative
- b)  $y = 8x^9 - 3x^{12} - 5x^6 + 2$  end behavior ↘
- c)  $y = -5x^2(x+9)(x-7)^2$  the x-intercepts 0, -9, 7
- d)  $y = 4x(x-12)^5(x-4)^2$  multiplicity for the factor 4 2
- e)  $y = 3x^2(x-5)^2(x-3)^3$  at 3, the graph will cross / bounce / wiggle w
- f)  $y = -4x^6 + 3x^2 - 8x + 12$  the degree – number and odd even
- g)  $y = 9x^2 - 12x - 22$  the y-intercept -22
- h)  $y = 9x + 8x^2 - 13x^7 - 10$  the leading coefficient – positive / negative negative
- i)  $y = x^3(x+4)(x-2)^2(x-7)$  the degree – number and odd / even odd
- j)  $y = (x-4)^4(x+5)^3(x-3)^2$  end behavior ↗

14) **Graph the Polynomial:**  $f(x) = -x^5 - 3x^4 - 2x^3 + x + 1$  on a calculator and find the following features.



- Degree: 5
- # of Solutions: 5
- Max # of Turning Pts: 2
- Positive or Negative Leading Coefficient? (circle one)
- End Behavior: ↘
- x-intercepts: -2.1, -1, 0.7
- y-intercept: 1
- Local Maximums: ( 0.3 , 1.2 )
- Local Minimums: ( -1.7 , -1.75 ) , (  )
- Domain: (-∞, ∞)
- Range: (-∞, ∞)
- Increasing: [-1.7, 0.3]
- Decreasing: (-∞, -1.7] ∪ [0.3, ∞)

15) Refer to the data table:

- a. Show how you can use finite differences to determine the degree of the polynomial that fits the data.

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x	0	1	2	3	4	5
y	2	0	6	56	210	552

-2 6 50 154 342  
 8 44 104 188  
 36 60 84  
 24 24

- b. Use the regression feature of your calculator to write the polynomial function for this relationship.

$$y = .9x^4 - 3x^2 + 1.99$$

Writing Equations

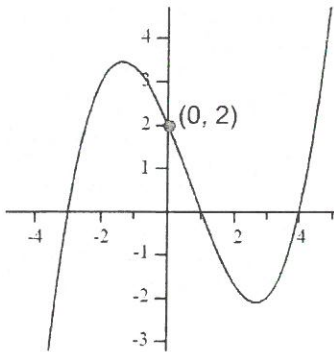
- 16) Write a polynomial function  $f(x)$  of **least degree** that has a leading coefficient of 1, and the given zeros: -2, 5, 3

$$f(x) = (x+2)(x-5)(x-3)$$

- 17) Write an equation of the following polynomial.

Multiply factors to write the equation in **standard form** (don't forget about  $a$ ).

$$y = \frac{1}{6}(x+3)(x-1)(x-4)$$



$$f(x) = a(x+3)(x-1)(x-4)$$

$$2 = a(0+3)(0-1)(0-4)$$

$$2 = a(3)(-1)(-4)$$

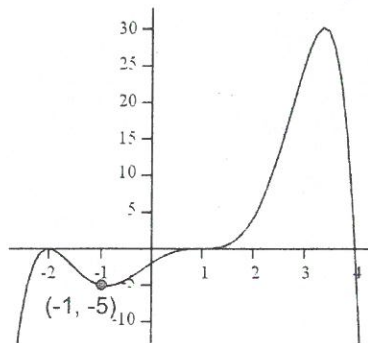
$$2 = a(12)$$

$$\frac{1}{6} = a$$

- 18) Write an equation of the following polynomial.

You may leave it in **factored form** (don't forget about  $a$ ).

$$y = \frac{-1}{8}(x+2)^2(x-1)^3(x-4)$$



$$f(x) = a(x+2)^2(x-1)^3(x-4)$$

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

$$-5 = a(1)^2(-2)^3(-5)$$

$$-5 = a(1)(-8)(-5)$$

$$-5 = a(40)$$

$$a = -1/8$$

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