

MARTIAN DARTS

2.1, 2.3-2.5 Quest Review



Question #1 (No Calc)

Graph the following polynomial.

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

State the:

- Leading term
- Zeros (with multiplicity)
- y -intercept
- End behavior (in the correct notation)

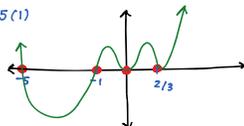
Question #1 (No Calc)

Graph the following polynomial.

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

State the:

- Leading term $-x^2 \cdot x^3 \cdot (3x)^2 \cdot (-x) = 9x^8$
- Zeros (with multiplicity) $0(2) \quad -1(3) \quad \frac{2}{3}(2) \quad -5(1)$
- y -intercept $-0^2(1)^3(-2)^2(-5) = 0$
- End behavior (in the correct notation)
 $\lim_{x \rightarrow \infty} f(x) = \infty$ $\lim_{x \rightarrow -\infty} f(x) = \infty$



Question #2 (No Calc)

Find the vertex of the following quadratic by completing the square.

$$y = 3x^2 - 12x + 5$$

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Find the vertex of the following quadratic by completing the square.

$$y = 3(x^2 - 4x) + 5 \quad -\frac{4}{2} = (-2)^2 = 4$$

$$y = 3(x^2 - 4x + \underline{4}) + 5 - \underline{12}$$

$$y = 3(x-2)^2 - 7$$



Vertex: (2, -7)

Question #3 (Calc OK)

Find the linear factorization of the following polynomial (factor completely).

$$f(x) = x^4 + x^3 + 5x^2 - x - 6$$

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$$f(x) = x^4 + x^3 + 5x^2 - x - 6$$

$$x = -1, 1 \quad f(x) = (x+1)(x-1)(x - \frac{-1+i\sqrt{23}}{2})(x - \frac{-1-i\sqrt{23}}{2})$$

$$\begin{array}{r|rrrr|r} -1 & 1 & 1 & 5 & -1 & -6 \\ \downarrow & -1 & 0 & -5 & 6 & \\ \hline & 1 & 0 & 5 & -6 & 0 \end{array} \quad \begin{array}{r|rrrr|r} 1 & 1 & 0 & 5 & -6 \\ \downarrow & 1 & 1 & 6 & \\ \hline & 1 & 1 & 6 & 0 \end{array}$$

$$(x+1)(x^3+5x-6) \quad (x+1)(x-1)(x^2+x+6)$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(6)}}{2(1)} = \frac{-1 \pm \sqrt{-23}}{2} = \frac{-1 \pm i\sqrt{23}}{2}$$

Question #4 (No Calc)

Write the equation of a quadratic that has a vertex of (2, -4) and goes through the point (-3, -24).

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$$y = a(x-h)^2 + k$$

$$-24 = a(-3-2)^2 - 4$$

$$-20 = a(-6)^2$$

$$\frac{-20}{36} = \frac{36a}{36}$$

$$-\frac{5}{9} = a$$

$$y = -\frac{5}{9}(x-2)^2 - 4$$

Question #5 (No Calc)

Write the function with real coefficients whose zeros include 2 (multiplicity 2) and $3+i$ (multiplicity 1).

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$$y = (x-2)^2(x - (3+i))(x - (3-i))$$

Question #6 (No Calc)

Convert the following quadratic to vertex form:

$$y = -2x^2 + 10x - 7$$

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Convert the following quadratic to vertex form:

$$y = (-2x^2 + 12x) - 7 \quad -\frac{b}{2a} = \frac{-6}{-2} = 3 \Rightarrow 9$$

$$y = -2(x^2 - 6x + \frac{9}{1}) - 7 + 18$$

$$y = -2(x-3)^2 + 11$$

Question #7 (No Calc)

Find the remainder of the following polynomial.

$$(4x^4 - 3x^3 + 2x^2 - x + 1) \div (x - 1)$$

{Challenge} Can you find the remainder using another method?Question #7 (No Calc)

Find the remainder of the following polynomial.

$$(4x^4 - 3x^3 + 2x^2 - x + 1) \div (x - 1)$$

{Challenge} Can you find the remainder using another method?

$$\begin{array}{r|rrrrr} 1 & 4 & -3 & 2 & -1 & 1 \\ & \downarrow & 4 & 1 & 3 & 2 \\ \hline & 4 & 1 & 3 & 2 & \textcircled{3} \end{array} \quad \text{OR} \quad \begin{array}{l} 4(1)^4 - 3(1)^3 + 2(1)^2 - (1) + 1 \\ 4 - 3 + 2 - 1 + 1 \\ \textcircled{3} \end{array}$$

Question #8 (No Calc)Write the equation of a line in point-slope form if $f(-2)=3$ and $f(1)=6$.**{Challenge}**: Can you write another equation of the same line in point-slope form?Question #8 (No Calc)Write the equation of a line in point-slope form if $f(-2)=3$ and $f(1)=6$.

$$(-2, 3) \quad (1, 6)$$

{Challenge}: Can you write another equation of the same line in point-slope form?

$$m = \frac{6-3}{1-(-2)} = \frac{3}{3} = 1$$

$$y - 3 = 1(x + 2)$$

$$y - 6 = 1(x - 1)$$

OR

$$\text{in slope-int: } y = x + 5$$

Question #9 (No Calc)

Find the end behavior of the following polynomial. Be sure to write it in proper limit notation.

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

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

right ↑, Left ↓

$$\lim_{x \rightarrow \infty} f(x) = \infty \quad \lim_{x \rightarrow -\infty} f(x) = -\infty$$

Question #10 (No Calc)

What is the leading term, leading coefficient and degree of the following polynomial?

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

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$$\text{L.T. : } 3(-x) \cdot x^2 \cdot x^3 = -3x^6$$

$$\text{L.C. : } -3$$

$$\text{Degree : } 6$$

Question #11 (Calc OK)

Graph the following polynomial.

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

State the:

- Leading term
- Zeros (with multiplicity)
- y-intercept
- End behavior (in the correct notation)

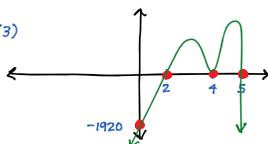
Question #11 (Calc OK)

Graph the following polynomial.

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

State the:

- Leading term : $3(-x)(x)^2(x)^3 = -3x^6$
- Zeros (with multiplicity) : 5 (1) 4 (2) 2 (3)
- y-intercept : $3(5)(-4)^2(-2)^3 = -1920$
- End behavior (in the correct notation)
 $\lim_{x \rightarrow \infty} f(x) = -\infty$ $\lim_{x \rightarrow -\infty} f(x) = -\infty$

Question #12 (Calc OK)

Find the linear factorization of the following polynomial (factor completely).

$$f(x) = 3x^3 - x^2 - 13x - 5$$

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Find the linear factorization of the following polynomial (factor completely).

$$f(x) = 3x^3 - x^2 - 13x - 5$$

$$x = -1\frac{2}{3} \left(-\frac{5}{3}\right)$$

$$f(x) = (3x+5)(x-(1+\sqrt{2}))(x-(1-\sqrt{2}))$$

$$\begin{array}{r|rrrr} -5 & 3 & -1 & -13 & -5 \\ & \downarrow & -5 & 10 & 5 \\ \hline & 3 & -6 & -3 & 0 \end{array}$$

$$(3x+5)(x^2-2x-1)$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{8}}{2}$$

$$x = \frac{2 \pm 2\sqrt{2}}{2} = 1 \pm \sqrt{2}$$

Question #13 (Calc OK)

The Hinsdale Little League uses a baseball throwing machine to help train 10-year-old players to catch high pop-ups. If the machine throws the baseball straight up with an initial velocity of 48 ft/sec from a height of 3.5 ft ...

- Find an equation that models the height, $h(t)$, of the ball t seconds after it is thrown.
- What is the maximum height the baseball will reach? How many seconds will it take to reach that height?

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- Find an equation that models the height, $h(t)$, of the ball t seconds after it is thrown.

$$h(t) = -16t^2 + 48t + 3.5$$

- What is the maximum height the baseball will reach? How many seconds will it take to reach that height?

Vertex! $(1.5, 39.5)$ 39.5 ft after 1.5 sec

Question #14 (No Calc)

Divide the following polynomials. Express your answer in fraction form.

$$(x^4 - 3x^3 + 6x^2 - 3x + 5) \div (x^2 + 1)$$

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$$(x^4 - 3x^3 + 6x^2 - 3x + 5) \div (x^2 + 1)$$

$$\begin{array}{r} x^2 - 3x + 5 \\ x^2 + 0x + 1 \overline{) x^4 - 3x^3 + 6x^2 - 3x + 5} \\ \underline{-(x^4 + 0x^3 + x^2)} \\ -3x^3 + 5x^2 - 3x \\ \underline{-(-3x^3 + 0x^2 - 3x)} \\ 5x^2 + 0x + 5 \\ \underline{-(5x^2 + 0x + 5)} \\ 0 \end{array}$$

Question #15 (Calc OK)

An asset with a first cost of \$100,000 is depreciated over 5-year period. It is expected to have a \$10,000 salvage value at the end of 5 years. Using the straight-line method, what is the book value at the end of year 2?

Question #15 (Calc OK)

An asset with a first cost of \$100,000 is depreciated over 5-year period. It is expected to have a \$10,000 salvage value at the end of 5 years. Using the straight-line method, what is the book value at the end of year 2?

$$(0, 100K) \quad (5, 10K)$$

$$m = \frac{10K - 100K}{5 - 0} = -18K$$

$$y = -18000x + 100,000$$

$$y = -18000(2) + 100000 = \$64,000$$