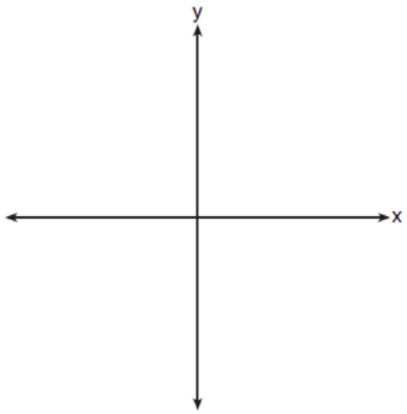
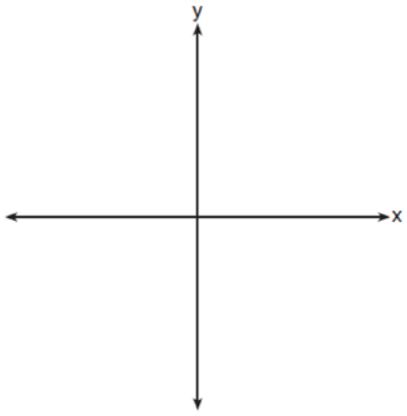
F.IF.C.7: Graphing Polynomial Functions

1 The zeros of a quartic polynomial function are 2, –2, 4, and –4. Use the zeros to construct a possible sketch of the function, on the set of axes below.

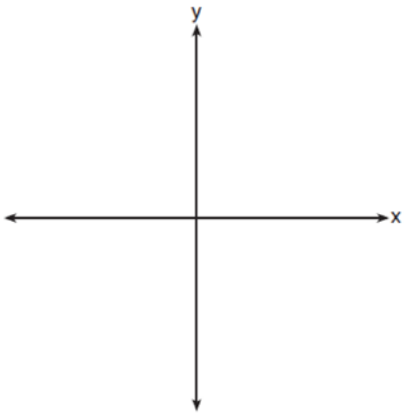


2 Sketch a graph of polynomial $P(x)$, given the criteria below:

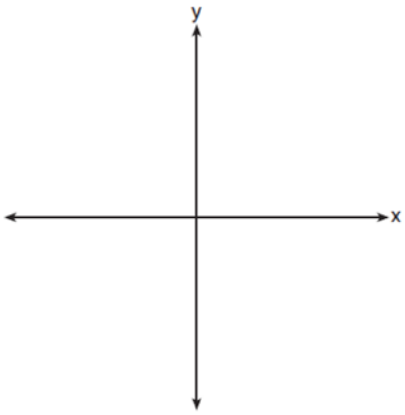
- $P(x)$ has zeros only at $-5, 1,$ and 4
- As $x \to \infty, P(x) \to -\infty$
- As $x \to -\infty, P(x) \to -\infty$



3 On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.

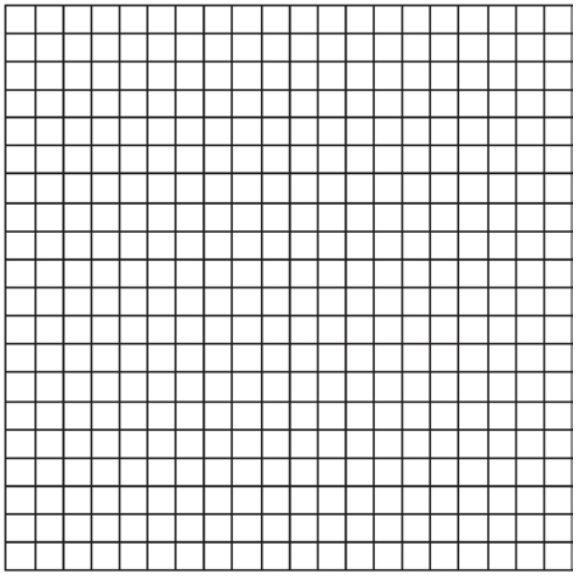


4 Patricia creates a cubic polynomial function, $p(x)$, with a leading coefficient of 1. The zeros of the function are 2, 3, and –6. Write an equation for $p(x)$. Sketch $y = p(x)$ on the set of axes below.

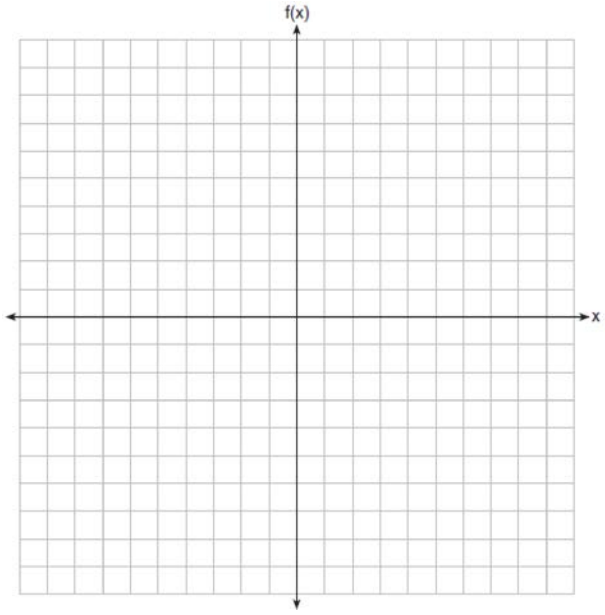


5 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and -2.

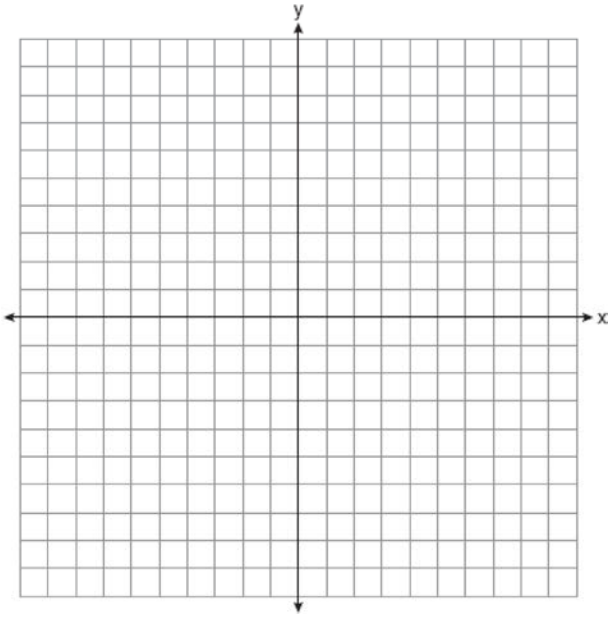
6 The zeros of a quartic polynomial function h are $-1, \pm 2$, and 3. Sketch a graph of $y = h(x)$ on the grid below.



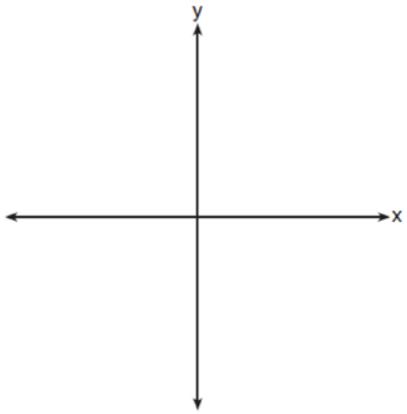
7 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \le x \le 4$.



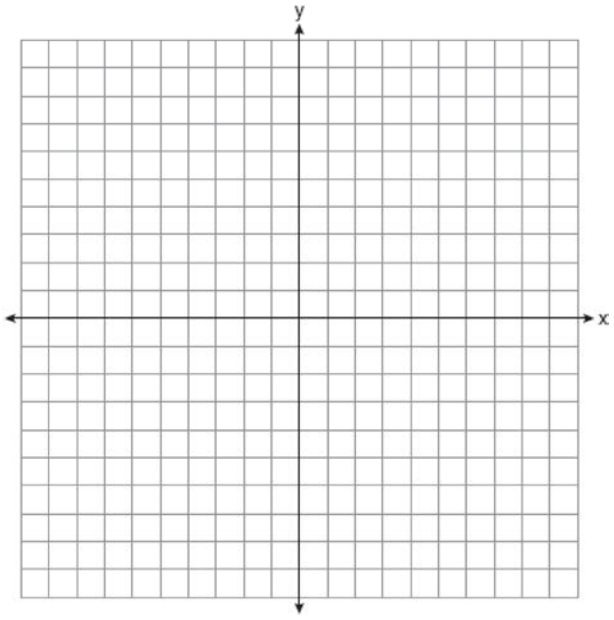
8 Graph $y = x^3 - 4x^2 + 2x + 7$ on the set of axes below.



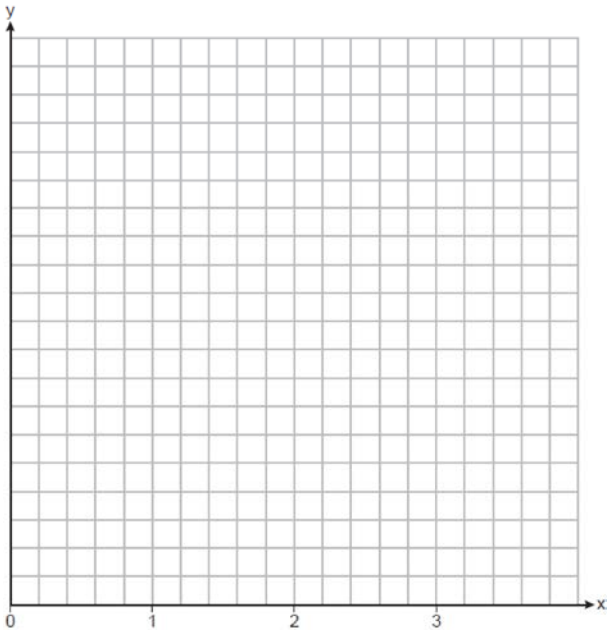
9 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$. On the axes below, sketch $y = c(x)$.



10 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$. On the set of axes below, graph $y = p(x)$.



11 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \le x \le 3$. Graph $y = v(x)$ over the domain $0 \le x \le 3$.

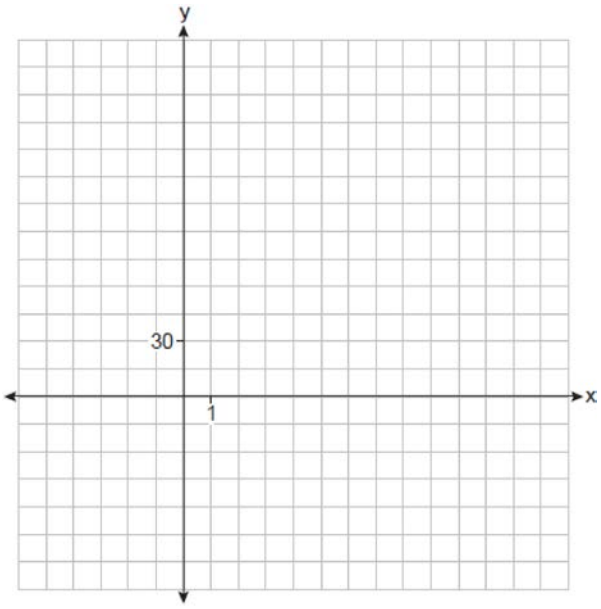


To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

12 A manufacturer of sweatshirts finds that profits and costs fluctuate depending on the number of products created. Creating more products doesn't always increase profits because it requires additional costs, such as building a larger facility or hiring more workers. The manufacturer determines the profit, $p(x)$, in thousands of dollars, as a function of the number of sweatshirts sold, x, in thousands. This function, p, is given below.

$$p(x) = -x^3 + 11x^2 - 7x - 69$$

Graph $y = p(x)$, over the interval $0 \le x \le 9$, on the set of axes below.



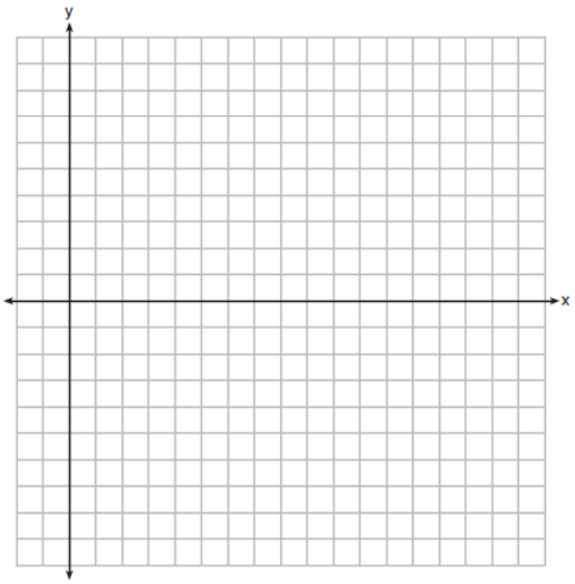
Over the given interval, state the coordinates of the maximum of p and round all values to the *nearest integer*. Explain what this point represents in terms of the number of sweatshirts sold and profit. Determine how many sweatshirts, to the *nearest whole sweatshirt*, the manufacturer would need to produce in order to first make a positive profit. Justify your answer.

13 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$

$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

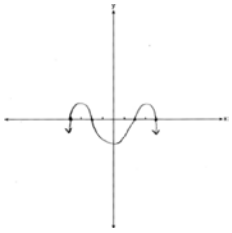
The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form. Graph $y = P(x)$ on the set of axes below over the domain $2 \le x \le 16$.



Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

F.IF.C.7: Graphing Polynomial Functions
Answer Section

1 ANS:



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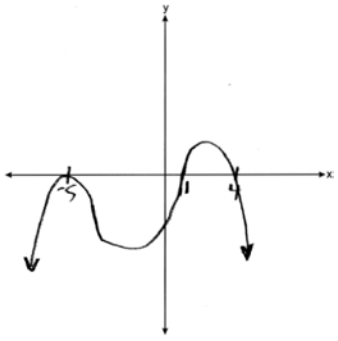

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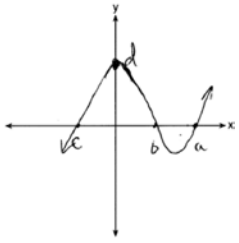

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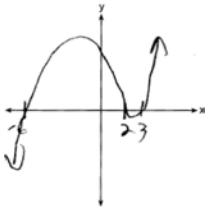
4 ANS:



$p(x) = (x-2)(x-3)(x+6)$

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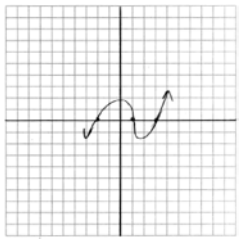
5 ANS:



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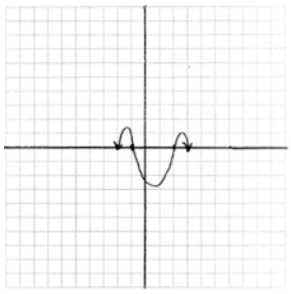

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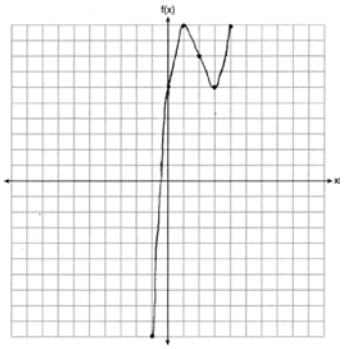

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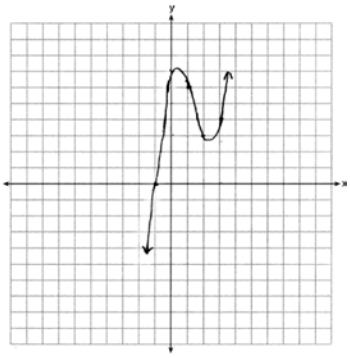
8 ANS:



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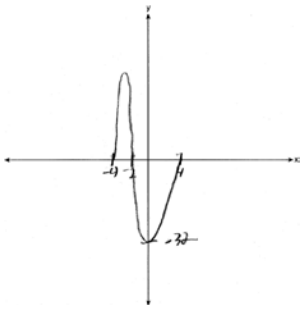
9 ANS:



$x^3 + 2x^2 - 16x - 32 = 0$

$x^2(x+2) - 16(x+2) = 0$

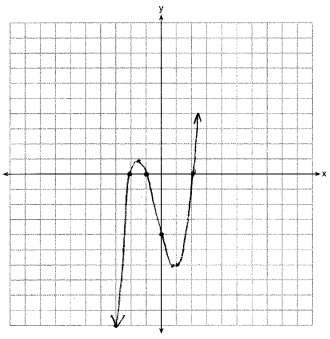
$(x^2 - 16)(x+2) = 0$

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

$x = -4, 4, -2$

REF: 012536aii

10 ANS:



$0 = x^2(x+1) - 4(x+1)$

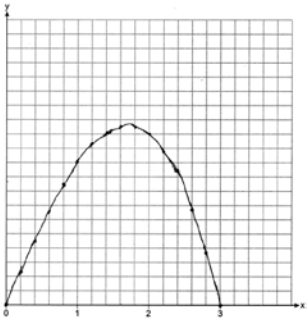
$0 = (x^2 - 4)(x+1)$

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

$x = -2, -1, 2$

REF: 081633aii

11 ANS:



12.6

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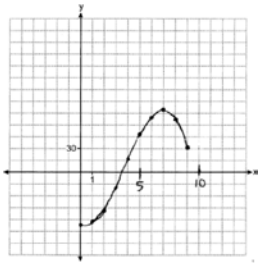
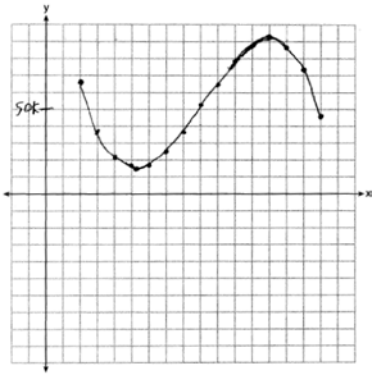
12 ANS:



(7,78) If 7000 sweatshirts are sold, the profit is $78,000. 3,549, because that is when $p(x)$ is first greater than 0.

REF: 012437aii

13 ANS:



$P(x) = R(x) - C(x) = -330x^3 + 9000x^2 - 67000x + 167000$ Least profitable at year 5 because there is a minimum in $P(x)$. Most profitable at year 13 because there is a maximum in $P(x)$.

REF: 081837aii