

Show work where work is required. This can be worth partial credit.

$$\begin{aligned} \sqrt{-81} &= \sqrt{81 \cdot -1} \\ &= \sqrt{81} \cdot \sqrt{-1} \\ &= 9i \end{aligned}$$

1a. (+3) Write the following value as an imaginary number: $\sqrt{-81} =$ $9i$

1b. (+3) Perform the operation and write the answer in the $a + bi$ form.

$$\begin{aligned} (3+i) - (2 - \sqrt{-81}) &= \boxed{1 + 10i} \\ (3+i) - (2 - \sqrt{81} \cdot -1) & \\ 3+i - 2 + \sqrt{81} & \\ 1+i + 9i &= \end{aligned}$$

1c. (+3) Perform the operation and write the answer in the $a + bi$ form.

$$\begin{aligned} (1+2i)(7-5i) &= \boxed{17+9i} \quad i^2 = -1 \\ (1+2i)(7-5i) & \\ 7+5i+14i-10i^2 & \\ 7+9i - (10)(-1) &= 7+9i+10 \end{aligned}$$

1d. (+3) Perform the operation and write the answer in the $a + bi$ form.

$$\begin{aligned} (3-i)^2 &= \boxed{8-6i} \\ (3-i)(3-i) & \\ 9-3i-3i+i^2 & \\ 9-6i+(-1) &= 9-6i-1 \end{aligned}$$

2. (+13) Solve the following equation by using the Quadratic Formula. Find all solutions, both real and imaginary (i.e. complex). Give exact answers without using decimals.

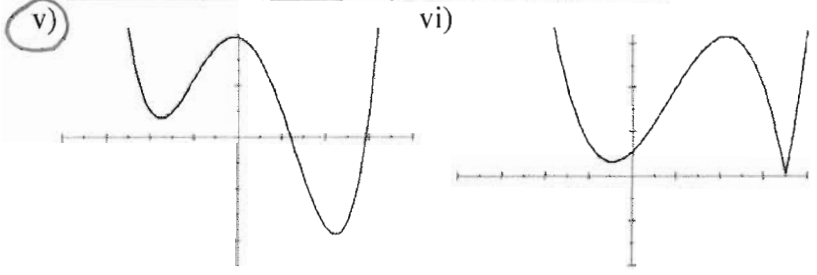
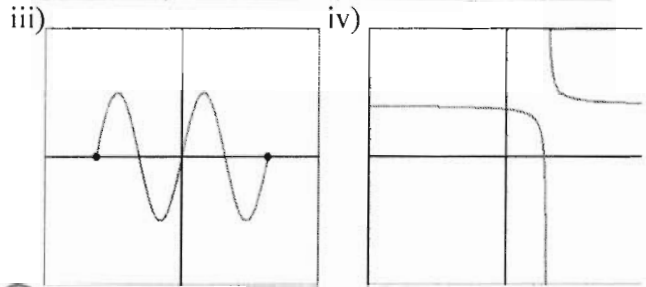
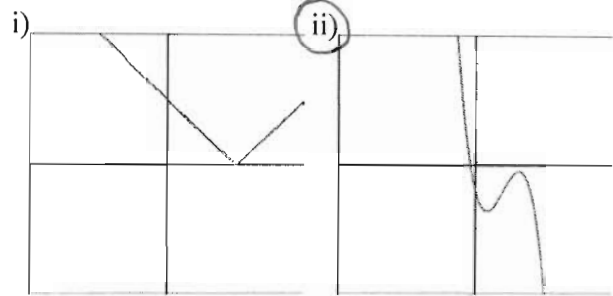
$$x^2 + 5x + 8 = 0$$

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-5 \pm \sqrt{5^2 - 4(1)(8)}}{2(1)} \\ &= \frac{-5 \pm \sqrt{25 - 32}}{2} \\ &= \frac{-5 \pm \sqrt{-7}}{2} \\ &= \frac{-5 \pm \sqrt{7 \cdot -1}}{2} \end{aligned}$$

$$x = \frac{-5 + i\sqrt{7}}{2}, \frac{-5 - i\sqrt{7}}{2}$$

$$= \frac{-5 \pm i\sqrt{7}}{2}$$

3. (+12) Which of the following functions *could* be a polynomial function? Circle all correct answers.



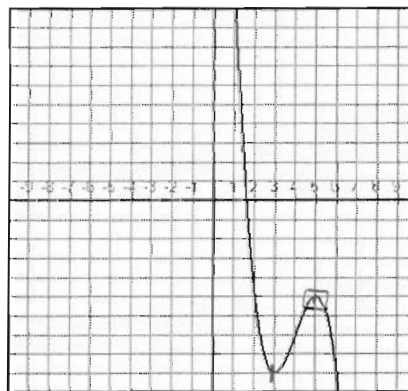
4. Study the graph of the polynomial function f shown here. (+15)

4a. How many x -intercepts are shown? 1

4b. How many turning points are shown? 2

4c. What is the **smallest** degree f could have? 3

$\text{Degree} = \text{TP} + 1$



4d. Estimate the coordinates of the rightmost turning point of f . (5, -5)

4e. The function f is increasing over which set? Circle your answer.

- i. $(-\infty, -9] \cup [-5, \infty)$ ii. $[-9, -5]$ iii. $(-\infty, 3] \cup [5, \infty)$ **iv. $[3, 5]$**

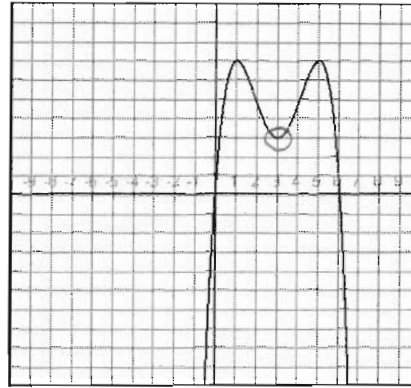
5a. (+6) Find the degree of the polynomial function $g(x) = 4x^4 - 5x^6 - x^2 + 4x - 3$.

6

5b. (+6) Find the leading coefficient of the polynomial function

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

6. Study the graph of the polynomial function f shown here. (+12)



6a. True or False: The degree is even. Circle your answer.

6a. True or False: The leading coefficient is positive. Circle your answer.

6b. What are the coordinates of the valley turning points of the function f ?

(3, 3)

6c. What are the coordinates of the peak turning points of the function f ?

(1, 7) and (5, 7)

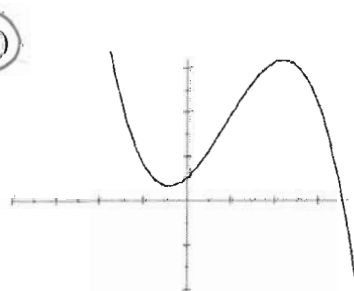
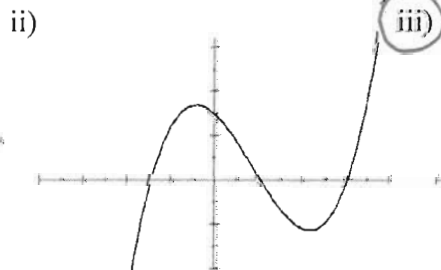
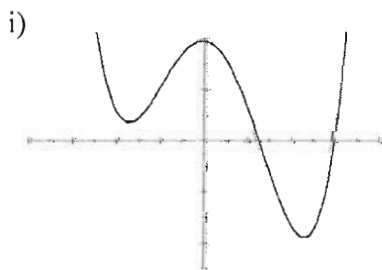
7. (+12) Read the paragraph through once and then fill in the blanks. Consider the polynomial function $h(x) = 200x^7 + 500x^5 - 2x^3 + 10$. The degree of the polynomial function is 7 and the leading coefficient of the polynomial function is 200 (positive/negative). The end behavior of the graph of h is that it falls (falls/rises) to the far left and it rises (falls/rises) to the far right. The maximum number of x -intercepts of this function is 7. The maximum number of turning points of this function is 6.

Degree: ODD
LC: positive
↗
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8. (+12) Which of the following *could* be the graph of the following polynomial function? Circle all correct answers.

$$f(x) = \boxed{-3x^3} - bx^2 + cx + 7$$

DEGREE: ODD
LC: NEGATIVE



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