

Practice 01

2.7 Piecewise Defined Functions

3.2 Polynomial Functions

3.3 Division of Polynomials and the Remainder and Factor Theorems

3.4 Zeros of Polynomials

Evaluate the function for the given values of x .

1)

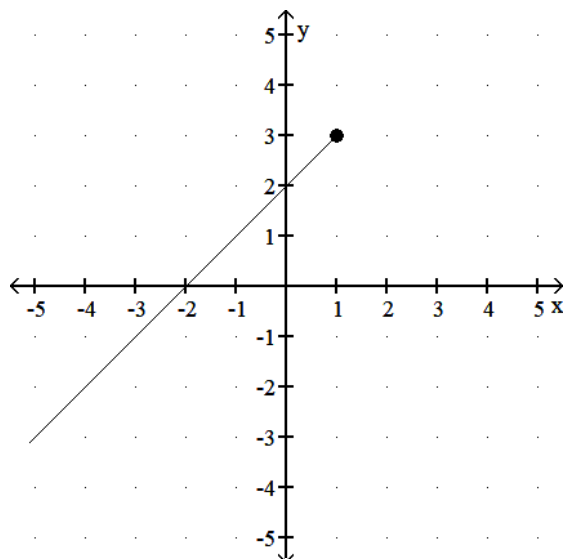
$$f(x) = \begin{cases} -5x + 4, & \text{for } x < -1 \\ x^2 + 3, & \text{for } -1 \leq x < 2 \\ 1, & \text{for } x \geq 2 \end{cases}$$

(a) $f(-1)$; (b) $f(3)$

1) _____

Match the function with the graph.

2)



A) $f(x) = x + 2$ for $x \geq 1$

C) $f(x) = x + 2$ for $x \leq 1$

B) $f(x) = x + 2$ for $x \geq 3$

D) $f(x) = x + 2$ for $x \leq 3$

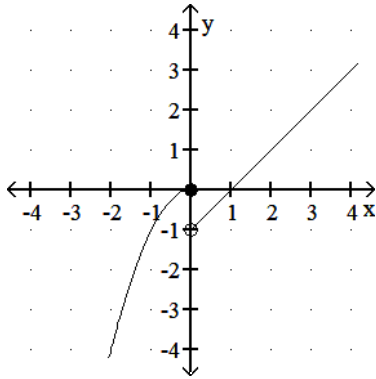
2) _____

Graph the function.

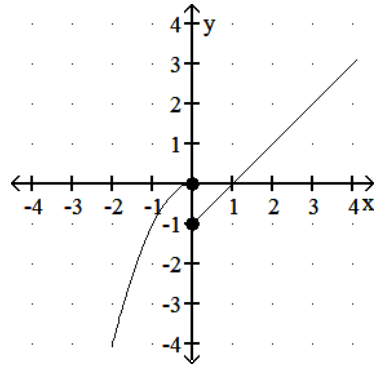
$$3) f(x) = \begin{cases} x - 1, & \text{for } x > 0 \\ -x^2, & \text{for } x \leq 0 \end{cases}$$

3) _____

A)



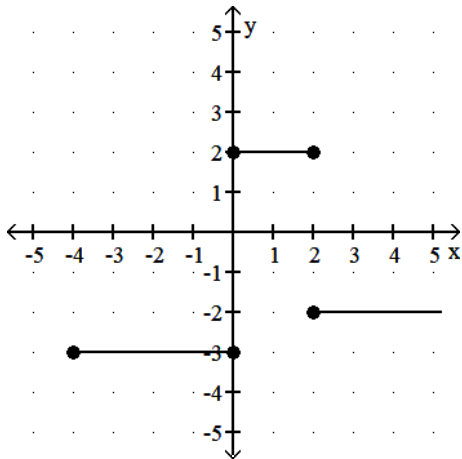
B)



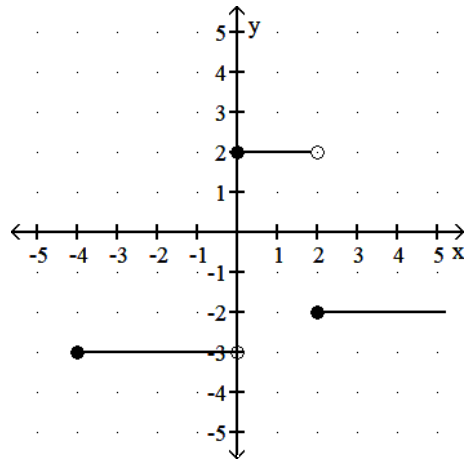
$$4) r(x) = \begin{cases} -3 & \text{for } -4 \leq x < 0 \\ 2 & \text{for } 0 \leq x < 2 \\ -2 & \text{for } x \geq 2 \end{cases}$$

4) _____

A)



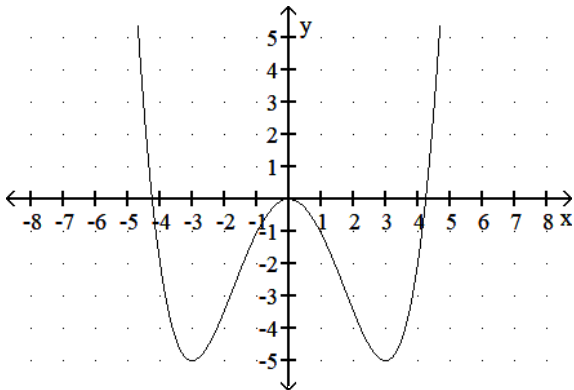
B)



Identify the location and value of any relative maxima or minima of the function.

5)

5) _____



Determine the end behavior of the graph of the function.

6) $f(x) = 8x^6 + 3x^5 + 3x^4 + 7$

A) Up left and up right

B) Down left and down right

6) _____

7) $4(x + 2)(8x + 7)^3(x + 2)^5$

A) As $x \rightarrow -\infty, f(x) \rightarrow -\infty$; As $x \rightarrow \infty, f(x) \rightarrow \infty$

B) As $x \rightarrow -\infty, f(x) \rightarrow -\infty$; As $x \rightarrow \infty, f(x) \rightarrow -\infty$

7) _____

Find the zeros of the function and state the multiplicities.

8) $f(x) = 2x^5 + 9x^4 + 7x^3$

A) 0 (m 3), -1 (m 1), $-\frac{7}{2}$ (m 1)

B) 0 (m 3), 1 (m1), $\frac{7}{2}$ (m1)

8) _____

9) $f(x) = -2x^6(x + 7)^2(x - 5)^6$

A) 0 (multiplicity 6), -7 (multiplicity 2), 5 (multiplicity 6)

B) 0 (multiplicity 6), 7 (multiplicity 2), -5 (multiplicity 6)

9) _____

10) $m(x) = x^5 - 3x^3$

A) $-\sqrt{3}, \sqrt{3}$ each of multiplicity 1; 0 of multiplicity 3

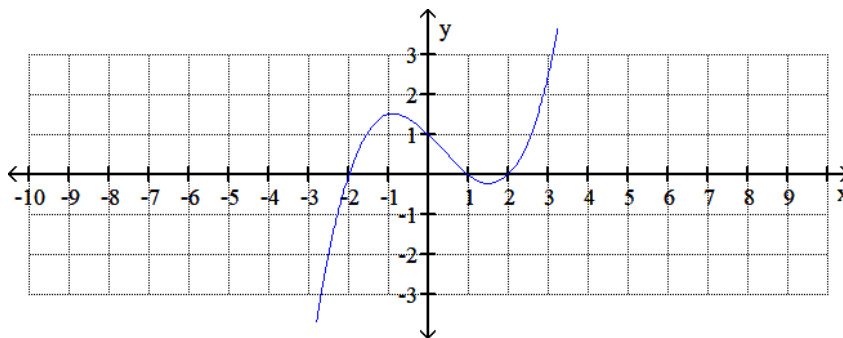
B) $-\sqrt{3}, \sqrt{3}$ each of multiplicity 3; 0 of multiplicity 1

10) _____

Determine if the graph can represent a polynomial function.

11)

11) _____



a. Determine the minimum degree of the polynomial based on the number of turning points.

b. Determine whether the leading coefficient is positive or negative based on the end behavior and whether the degree of the polynomial is odd or even.

c. Approximate the real zeros of the function, and determine if their multiplicity is odd or even.

Use synthetic division to divide the polynomials.

$$12) \frac{6x^5 + 16x^4 + 13x^3 + 23x^2 + 24x - 4}{x + 2}$$

12) _____

A) $6x^3 + 4x^2 + 5x + 13 - \frac{2}{x + 2}$

B) $6x^4 + 4x^3 + 5x^2 + 13x - 2$

Use long division to divide.

$$13) (4x^3 - 17x^2 - 1x + 29) \div (x - 4)$$

13) _____

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

B) $4x^2 - 1x - 5 + \frac{9}{x - 4}$

14) The following table represents the result of a synthetic division.

14) _____

$$\begin{array}{r|rrrr} 1 & 9 & 9 & 4 & 5 \\ & & 9 & 18 & 22 \\ \hline & 9 & 18 & 22 & \underline{27} \end{array}$$

Use x as the variable. Identify the divisor.

A) $9x^2 + 18x + 22$ Quotient

B) $x - 1$ Divisor

C) $9x^3 + 9x^2 + 4x + 5$ Dividend

D) 27 Remainder

Use the remainder theorem to evaluate the polynomial for the given value of x .

$$15) f(x) = 3x^4 - 7x^3 - 7x^2 + 42x - 19; f(3)$$

15) _____

A) 224

B) 98

Use the remainder theorem to determine if the given number c is a zero of the polynomial.

$$16) x^4 + 9x^3 + 22x^2 + 19x + 45; c = -3$$

16) _____

A) Yes

B) No

Use the factor theorem to determine if the given binomial is a factor of $f(x)$.

$$17) f(x) = 2x^3 + x^2 - 9x - 6; x - 1$$

17) _____

A) Yes

B) No

Solve the problem.

$$18) \text{Factor } f(x) = 3x^3 - 2x^2 - 53x - 60 \text{ given that } -3 \text{ is a zero.}$$

18) _____

A) $(x + 3)(3x^2 + 7x - 32)$

B) $(x + 3)(3x + 4)(x - 5)$

Write a polynomial $f(x)$ that meets the given conditions. Answers may vary.

19) Degree 3 polynomial with zeros 4, $5i$, and $-5i$

19) _____

A) $f(x) = x^3 - 4x^2 + 25x - 100$

B) $f(x) = x^3 + 4x^2 + 25x + 100$

List the possible rational zeros.

20) $f(x) = x^6 - 2x^4 + 7x^2 + 25$

20) _____

A) 1, 5, 25

B) $\pm 1, \pm \frac{1}{5}, \pm \frac{1}{25}$

C) -1, -5, -25

D) $\pm 1, \pm 5, \pm 25$

A polynomial $f(x)$ and one of its zeros are given. Find all the zeros.

21) $f(x) = x^4 - 6x^3 + 8x^2 + 30x - 65$; $3 - 2i$ is a zero

21) _____

A) $\pm 5, \pm 3 - 2i$

B) $\pm 5, 3 \pm 2i$

C) $\pm\sqrt{5}, \pm 3 - 2i$

D) $\pm\sqrt{5}, 3 \pm 2i$

Write a polynomial $f(x)$ that meets the given conditions.

22) Degree 3 polynomial with integer coefficients with zeros $-7i$ and $\frac{4}{5}$

22) _____

A) $f(x) = 25x^3 - 75x^2 + 296x - 112$

B) $f(x) = 5x^3 - 4x^2 + 245x - 196$

C) $f(x) = 5x^3 - 4x^2 - 245x + 196$

D) $f(x) = 25x^3 - 5x^2 - 264x + 112$

23) Polynomial of lowest degree with zeros of -2 (multiplicity 2) and 3 (multiplicity 2) and with $f(0) = -108$

23) _____

A) $f(x) = x^4 - 2x^3 - 11x^2 + 12x - 108$

B) $f(x) = -3x^4 + 6x^3 + 33x^2 - 36x - 108$

Answer Key

Testname: MAC1140_PRACTICE01

- 1) (a) 4; (b) 1
- 2) C
- 3) A
- 4) B
- 5) At $x = -3$, the function has a relative minimum of -5 .
At $x = 0$, the function has a relative maximum of 0 .
At $x = 3$, the function has a relative minimum of -5 .
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) **a.** Minimum degree 3
b. Leading coefficient positive degree odd
c. -2 , 1 , and 2 (with odd multiplicity)
- 12) B
- 13) B
- 14) B
- 15) B
- 16) B
- 17) B
- 18) B
- 19) A
- 20) D
- 21) D
- 22) B
- 23) B