**Unit F3: Functions – Cubic, Piece-wise, Square Root and Cubic Root Functions**

Topics Covered

* Identify key features, including *x*-intercepts, *y*-intercepts, domain, range, relative maxima, relative minima, and end behavior, of the graphs of cubic, piece-wise (including absolute value), square root and cubic root functions
* Graph cubic, piece-wise, square root and cubic root functions.

Standards

F-IF.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and by using technology for more complicated cases.

b: Graph square root, cube root, and piecewise-defined functions, using step functions and absolute value functions.

* Low Emphasis
* Which function is represented by the graph?

c: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

* Low Emphasis
* Which graph shows a quadratic function with zeroes at ….
* What happens to the function …. when the values of *x* are very large?

Answer Key

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| # | Correct | # | Correct | # | Correct | # | Correct | # | Correct |
| 1 | A | 5 | D | 9 | C | 13 | C | 17 | B |
| 2 | D | 6 | A | 10 | B | 14 | D | 18 | C |
| 3 | C | 7 | B | 11 | B | 15 | B | 19 | A |
| 4 | B | 8 | D | 12 | A | 16 | C | 20 | B |

21. Rubric

2-Points: Correctly matches both graphs to their functions and provides evidence.

1-Point: Correctly matches both graphs to their functions.

EXTRA CREDIT

22. B

23. D

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit F3: Cubic, Piece-wise, Square Root and Cubic Root Functions**

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| 1. Does the graph represent *y* as a function of *x*? 2. Yes, because for every *x*-value there is only one *y*-value. 3. Yes, because for every *y*-value there is only one *x-*value. 4. No, because there are two *y*-values for the same *x*-value. 5. No, because there are two *x*-values for the same *y*-value. | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-06 at 6.33.11 PM.png |

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| 1. What are the coordinates of a relative maximum shown on the graph below? 2. (1, 3) 3. (3, 1) 4. (5, 1) 5. (1, 5) |  |

1. What is the minimum value of the function y = |x + 3| – 2?
2. 2
3. 3
4. -2
5. -3

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| 1. Which of the following best describes the graph shown below? 2. A relative maximum is (2,0), and the function is quadratic. 3. A relative maximum is (0,6), and the function is cubic. 4. A relative minimum is (-3,0), and functions is cubic. 5. A relative maximum is (6,0), and function is quadratic. | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-06 at 8.06.13 PM.png |

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| 1. The graph of the function *f* (*x*) = is shown below.   The domain of the function is:   1. {x| x > 0} 2. {x| x 0} 3. {x| x > -4} 4. {x| x -4} | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-27 at 9.45.30 PM.png |

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| 1. Which inequality best represents the domain of the function shown on the graph below?    1. -1 *x*    2. -1 *y*    3. 2 *x*    4. 2 *y* | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-28 at 6.00.20 PM.png |

1. The graph of the function *f*(*x*) = *x*3 is shown below. Which statement is true in reference to the graph?

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| 1. The graph is not a function. 2. The function is increasing across the domain. 3. The function has a negative coefficient. 4. The *y*-intercept is 0. | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-05 at 9.04.11 PM.png |

1. The graph of *y* = f(*x*) is shown below.

Which set lists all the real solutions of f(*x*) = 0?

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| 1. {- 3, 2} 2. {- 2, 3} 3. {- 3, 0, 2} 4. {- 2, 0, 3} |  |

1. The graph of the polynomial function f(*x*) = *x*3 + 4*x*2 + 6*x* + 4 is shown below. What is the real solution?

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| 1. *x* = 4 2. *x* = 0 3. *x* = -2 4. *x* = 2 | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-27 at 6.27.43 PM.png |

1. The graph of the function f(*x*) = -*x*3 – 6*x*2 – 12*x* – 8 is shown below. What is the solution to the function?

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| 1. (0, -8) 2. (-2, 0) 3. (-1, -6) 4. (0, -2) | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-05 at 8.39.02 PM.png |

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| 1. What is the product of the roots of the equation x3 – 4x2 + x + 6 = 0 whose graph is shown below? 2. -36 3. -6 4. 6 5. 4 |  |

1. Which choice gives the roots of the function P(*x*) = *x*3 + 6*x*2 + 8*x*?
2. {-4, -2, 0}
3. {-4, 0, 2}
4. {0, 2, 4}
5. {-2, 0, 4}
6. Which statement describes the graph of the function y = – 1?
7. The *x*-intercept is (3, 0) and the *y*-intercept is (0, -1)
8. The *x*-intercept is (1, 0) and the *y*-intercept is (3, 0)
9. The *x*-intercept is (-3, 0) and the *y*-intercept is (0, 1)
10. The *x*-intercept is (-1, 0) and the *y*-intercept is (-3, 0)

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| 1. Which function represents the graph below? 2. *f*(*x*) = *x*3 – 6*x*2 – *x* + 7 3. *f*(*x*) = *x*3 – *x*2 – 5*x* – 6 4. *f*(*x*) = *x*3 – 6*x*2 – *x* + 6 5. *f*(*x*) = *x*3 – 2*x*2 – 5*x* + 6 | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-27 at 9.59.53 PM.png |

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| 1. Which function represents the graph below? 2. *y* = (*x* – 1)(*x* + 2)(*x* + 3) 3. *y* = (*x* + 1)(*x* – 2)(*x* – 3) 4. *y* = (*x* – 1)(*x* + 2)(*x* – 3) 5. *y* = (*x* + 1)(*x* – 2)(*x* + 3) |  |

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| 1. Which equation is represented by the graph below? 2. *y* = *x*2 – 3 3. *y* = (*x* – 3)2 4. *y* = |*x*| – 3 5. *y* = |*x* – 3| | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-28 at 5.44.05 PM.png |

1. Which is the graph of *y* = |*x*| + 2?

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| 1. Which equation matches the graph below? 2. *y* = *x*3 + 2*x*2 + *x* +2 3. *y* = +2 4. *y* = 2|*x* – 2| 5. *y* = -2*x*2 + *x* + 4 | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-05 at 10.15.11 PM.png |

1. Morgan can start wrestling at age 5 in Division 1. He remains in that division until his next odd birthday when he is required to move up to the next division level. Which graph correctly represents this information?

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1. Which function is represented by the graph below?

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|  | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-06-06 at 7.05.39 PM.png |

Extra Credit

1. Match the graphs below with the appropriate function and give evidence to support your conclusion.

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| Graph A  Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-28 at 9.00.43 AM.png | Graph B  Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-28 at 9.00.55 AM.png |

*f*(*x*) = -*x*3 – *x*2 + 5*x* – 3

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*g*(*x*) = *x*3 – *x*2

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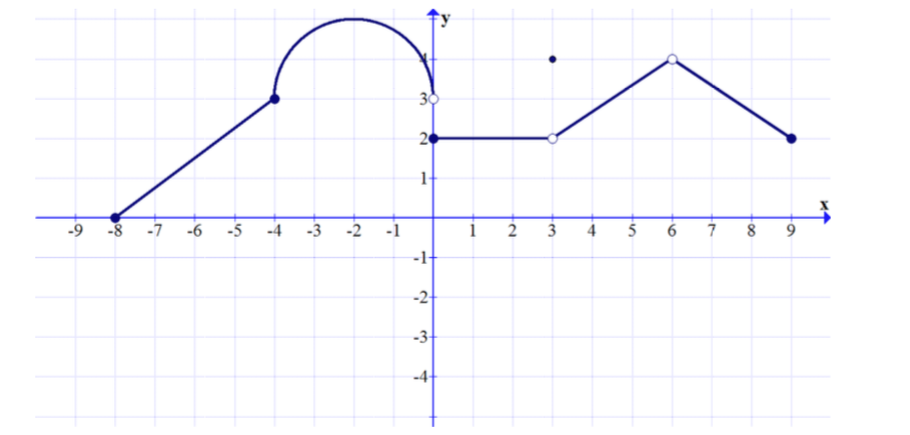
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1. In the graph below of *y* = 3*x*7 – 5*x*3  + *x*

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| How many extrema does the graph have?   1. 3 2. 4 3. 5 4. 6 | Macintosh HD:Users:Zwick:Desktop:Screen Shot 2017-05-28 at 6.12.06 PM.png |

1. The graph of a piece-wise function f(*x*) is shown below.



For which values of x is f(x) discontinuous across the interval -8 ≤ x ≤ 9?

1. f(*x*) is discontinuous when *x* = -8, *x* = -4 and *x* = 9
2. f(*x*) is discontinuous when *x* = -8, *x* = 3 and *x* = 4
3. f(*x*) is discontinuous when *x* = 2, *x* = 3 and *x* = -4
4. f(*x*) is discontinuous when *x* = 0, *x* = 3 and *x* = 6

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**Score Sheet and Report**

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| # | Answer | | Subdomain Score | Subdomain |
| 1 |  | | /13 | Key features of cubic, piece-wise, square root, and cubic root functions. |
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| 13 |  | |
| 14 |  | | /7 | Graphing cubic, piece-wise, square root, and cubic root functions. |
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| 16 |  | |
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| **Extra Credit** | | | | |
| 21 |  | Constructed Response – Record Your Answer Below | | |
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