

# Solutions for Math 120 Sample Final

Fall 2015

## Fill-in-the-Blank

- |                                |                  |
|--------------------------------|------------------|
| 1. $y = -1$                    | 2. $-2$          |
| 3. line $y = x$                | 4. $38 - 16i$    |
| 5. $4\sqrt{5}i$                | 6. $[7, \infty)$ |
| 7. left, 2, down 3             | 8. $-2x^2 + 1$   |
| 9. $-1$                        | 10. $3 - 5i$     |
| 11. 2 or 0 positive real zeros | 12. 3            |

## True or False

- |          |           |           |
|----------|-----------|-----------|
| 1. False | 2. True   | 3. False  |
| 4. False | 5. False  | 6. False  |
| 7. False | 8. False  | 9. True   |
| 10. True | 11. False | 12. False |

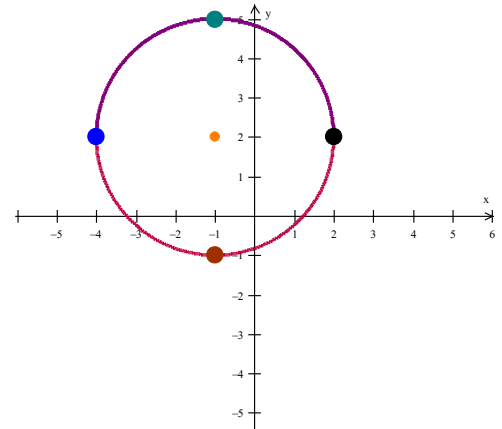
## Multiple Choice

- |      |      |      |
|------|------|------|
| 1. C | 2. D | 3. B |
| 4. C | 5. A | 6. B |
| 7. C |      |      |

## Exercises

1. Center  $(h, k) = (-1, 2)$ ; Radius  $r = 3$ . See graph.

Passes through points:  $(-1, 5), (2, 2), (-1, -1), (-4, 2)$



2.  $x = 11/6$

3. List Price - Discount = Sale Price

$$x - 0.25x = 225 \quad ; \quad x = \$300$$

4.  $x + (x + 1) = 525$  ; numbers are 262 and 263

5.  $\left\{ 1 \pm \frac{\sqrt{2}}{2} \right\}$

6.  $-\frac{8}{5} - \frac{19}{5}i$

7.  $\{-2, \pm\sqrt{3}i\}$

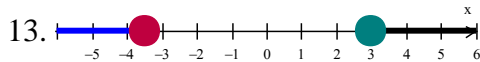
8.  $x = 1$

9.  $\{1, -7/3\}$

10.  $-4 \leq x < 6$

11.  $(-\infty, 1/3) \cup (5/9, \infty)$

12.  $\left[ -\frac{1}{6}, \frac{5}{6} \right]$

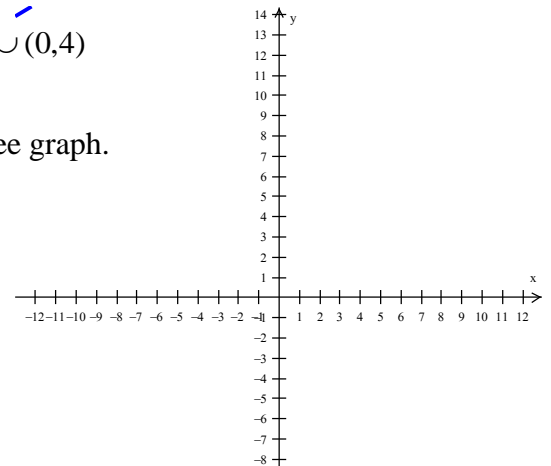


14.  $(-\infty, -2) \cup (0, 4)$

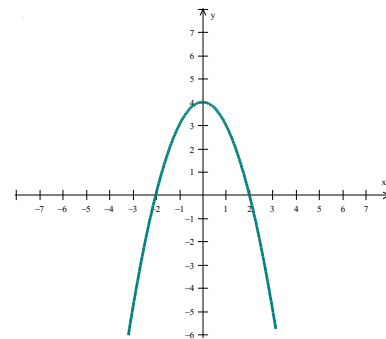
15. (a)  $y + 2 = \frac{7}{4}(x + 1)$  or  $y - 5 = \frac{7}{4}(x - 3)$

16. See graph.

(b)  $y = \frac{7}{4}x - \frac{1}{4}$



17. Graph passes the Vertical Line Test. See graph.  
Each  $x$ -value corresponds to just one  $y$ -value.  $y = 4 - x^2$



18.  $[-4, 5]$       19.  $(-7, 6]$       20.  $-3$       21.  $-3, 1, 3$   
22.  $(-4, -1) \cup (2, 5)$     23.  $(-1, 2)$       24. Neither

25.  $\frac{f(3) - f(1)}{3 - 1} = \frac{25 - (-1)}{2} = 13$

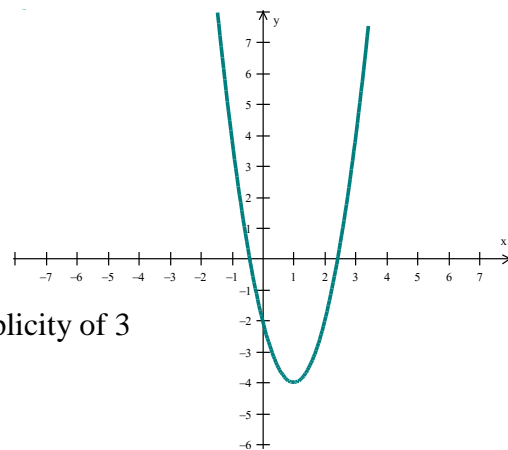
26.  $f(g(x)) = [\sqrt[3]{x+2}]^3 - 2 = x + 2 - 2 = x.$

$g(f(x)) = \sqrt[3]{(x^3 - 2) + 2} = \sqrt[3]{x^3} = x.$

The functions  $f$  and  $g$  are inverse functions.

27.  $f^{-1}(x) = \frac{5}{x} + 2$

28. (a) up      (b)  $(1, -4)$       (c)  $x = 1$   
(d)  $(0, -2)$       (e) two  $x$ -intercepts



29. (a)  $x = -5, x = 3/2$   
(b)  $x = -5$  has multiplicity of 2,  $x = 3/2$  has multiplicity of 3  
(c) touches at  $(-5, 0)$ , crosses at  $(3/2, 0)$   
(d) maximum of 4 turns  
(e) falls to the left (QIII) and rises to the right (QI)

30. Quotient:  $4x^2 - 3x + 9$ ; Remainder:  $-20$

31. Quotient:  $x^2 - 4x - 12$ ; Remainder:  $0$ ;

$x^3 - 28x - 48 = (x + 4)(x^2 - 4x - 12) = (x + 4)(x - 6)(x + 2)$

32.  $\left\{ \pm 1, \pm 3, \pm 9, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2} \right\}$

33. 3 or 1 positive real zeros; 1 negative real zero

34. Since  $f$  is a polynomial function,  $f(-1) = -1$  and  $f(0) = 3$ , then by the Intermediate Value Theorem, the function will have a zero,  $c$ , in the interval  $(-1, 0)$  such that  $f(c) = 0$ .

35. (a)  $x = -2$       (b)  $y = -3$       (c) none  
(d)  $x$ -intercept:  $(0, 0)$ ;  $y$ -intercept:  $(0, 0)$   
(e) See graph.

36.  $(x, y) = (-2, -4)$ ;

Note: by Cramer's Rule  $D_x = 44, D_y = 88, D = -22$ .

37. (a)  $\det(A) = 2$     (b)  $\begin{bmatrix} -5 & 15 \\ -16 & -2 \end{bmatrix}$     (c)  $\begin{bmatrix} 49 & 63 \\ 36 & 48 \end{bmatrix}$

