1. In the process of solving the radical equation, $x - 5 = \sqrt{3x - 11}$, you will need to solve which of the following quadratic equations?

   a)  $x^2 - 7x + 16 = 0$       b)  $x^2 - 3x - 14 = 0$        c)  $x^2 + 13x - 36 = 0$

   d)  $x^2 - 13x + 36 = 0$       e) none of these

2. Which of the following relations defines $y$ as a function of $x$?
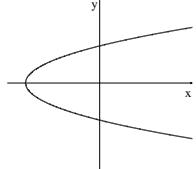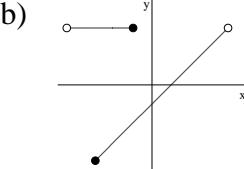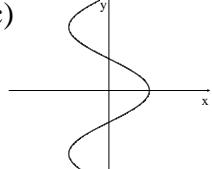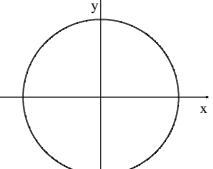
   b)              b)              c)              d)              e)
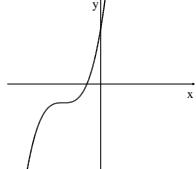
3. Which of the following relations defines $y$ as a function of $x$?

   a) $\{(-1,3),(-2,1),(-1,8),(3,5)\}$       b) $\{(-1,8),(8,1),(0,8),(3,1)\}$       c) $\{(0,4),(4,0),(0,-4),(3,0)\}$

   d) $\{(1,2),(3,4),(4,3),(1,1)\}$          e) $\{(6,10),(-6,5),(0,6),(-6,-5)\}$

4. Find the distance between the points (5,4) and (1,−1).

   a) 5              b) $3\sqrt{5}$              c) 9              d) 41              e) none of these

5. Determine whether the graph shown below is symmetric with respect to the $x$-axis, $y$-axis, origin, or none of these.   Then determine whether the function represented by the graph is even, odd, or neither.
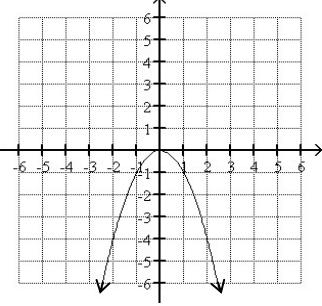
   a) $y$-axis, even       b) $y$-axis, odd       c) $x$-axis, even       d) origin, odd

   e) none of these, neither

1

6.  Suppose that the function $p(x) = -x^2 + 26x + 300$ describes the revenue in millions of dollars generated from sales of a certain item for a company, where $x$ represents the number of items sold. What is the maximum revenue the company may achieve for sales of this item?

    a) $13 million      b) $469 million      c) $807 million      d) $169 million      e) $339 million

7.  Find the center and radius of the circle whose equation is $x^2 - 10x + y^2 + 6y - 1 = 0$.

    a) center = $(-5,3)$; radius = $\sqrt{35}$      b) center = $(-5,3)$; radius = $35$      c) center = $(5,-3)$; radius = $\sqrt{35}$

    d) center = $(5,-3)$; radius = $35$      e) center = $(5,-3)$; radius = $1$

8.  Determine whether the function $f(x) = -3(x-1)^2 - 2$ has a minimum value or a maximum value and then find the value.

    a) It has a minimum value of 1.                b) It has a maximum value of 1.

    c) It has a maximum value of 2.                d) It has a minimum value of $-2$.

    e) It has a maximum value of $-2$.

9.  Given the functions $f(x) = 4x + 3$ and $g(x) = x^2 - 7x - 9$, find $(f + g)(x)$.

    a) $(f + g)(x) = x^2 - 4x - 5$                b) $(f + g)(x) = x^2 - 3x - 6$
    c) $(f + g)(x) = -x^2 + 3x + 6$               d) $(f + g)(x) = x^2 - 11x - 12$
    e) $(f + g)(x) = 5x^2 - 7x - 6$

10. Given the functions $f(x) = 3x^2 - 7x - 8$ and $g(x) = 2x^2 - 3x + 4$, find $(f - g)(x)$.

    a) $(f - g)(x) = -x^2 + 4x + 12$              b) $(f - g)(x) = -x^2 - 4x - 4$
    c) $(f - g)(x) = x^2 - 10x - 4$               d) $(f - g)(x) = x^2 - 7x - 8$
    e) $(f - g)(x) = x^2 - 4x - 12$

11. If $f(x) = 1 - x$ and $g(x) = -3x^2 - x - 1$, find $(g \circ f)(x)$.

    a) $-3x^2 + 7x - 4$      b) $3x^2 + x + 2$      c) $-3x^2 + 7x - 5$      d) $-3x^2 + 5x - 4$      e) none of these

12. Find the domain and range of $f(x) = |x - 5|$.

    a) domain $= (-\infty,\infty)$, range $= (-\infty,\infty)$          b) domain $= (-\infty,\infty)$, range $= [0,\infty)$

    c) domain $= (-\infty,\infty)$, range $= [5,\infty]$          d) domain $= [0,\infty)$, range $= [-5,\infty)$

    e) domain $= [0,\infty)$, range $= [0,\infty)$

13. Which of the following is the graph of $g(x) = -\sqrt{x+2} + 1$?

a)

b)

c)

d)

e)
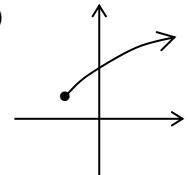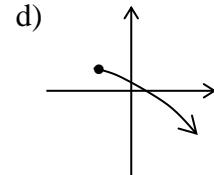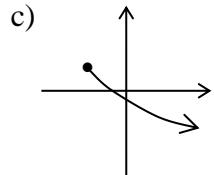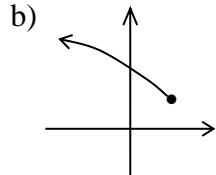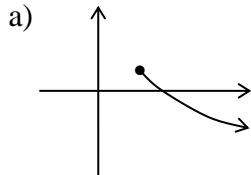

14. Determine which function graphed below has an inverse function.

a)

b)

c)

d)

e)
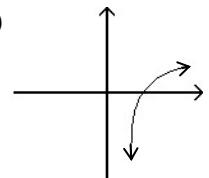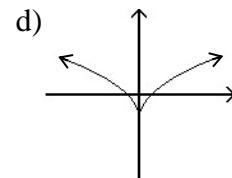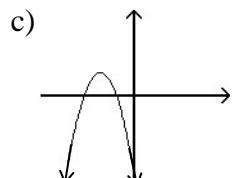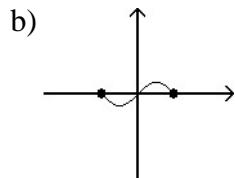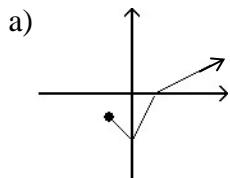

15. Solve $3^{4x-1} = 6$.

    a) $\left\{ \dfrac{3}{4} \right\}$        b) $\left\{ \dfrac{6 + \ln 3}{4 \ln 3} \right\}$        c) $\left\{ \dfrac{\ln 6 + \ln 3}{4 \ln 3} \right\}$        d) $\left\{ \dfrac{\ln 6}{4 \ln 3} \right\}$        e) $\left\{ \dfrac{\ln 9}{4 \ln 3} \right\}$

16. Solve $-2 < 21 - 2y < 10$.

    a) $\left[ \dfrac{11}{2}, \dfrac{23}{2} \right]$      b) $\left( -\infty, \dfrac{11}{2} \right) \cup \left( \dfrac{23}{2}, \infty \right)$    c) $\left( \dfrac{11}{2}, \dfrac{23}{2} \right)$       d) $\left( \dfrac{23}{2}, \dfrac{11}{2} \right)$       e) $\left( \dfrac{23}{2}, 10 \right)$

17. Solve $2x^2 + 5x \le 12$.

    a) $\left( -\infty, \dfrac{3}{2} \right]$      b) $(-\infty, -4] \cup \left[ \dfrac{3}{2}, \infty \right)$      c) $\left[ -4, \dfrac{3}{2} \right]$       d) $[-4, \infty)$       e) none of these

18. Find the domain of $f(x) = \sqrt{3-x}$.

a) $(-\infty, 3)$          b) $(-\infty, 3]$          c) $(3, \infty)$          d) $[3, \infty)$          e) $[0, \infty)$

19. Find the domain of the function $f(x) = \dfrac{3x-2}{x^2+3x-10}$.

a) $(-\infty, -5) \cup \left(-5, \dfrac{2}{3}\right) \cup \left(\dfrac{2}{3}, 2\right) \cup (2, \infty)$

b) $(-\infty, -2) \cup (-2, 5) \cup (5, \infty)$

c) $(-\infty, -5) \cup (-5, 2) \cup (2, \infty)$          d) $\{-5, 2\}$          e) $(-\infty, \infty)$

20. Evaluate $\log_3 \dfrac{1}{9}$.

a) $\frac{1}{2}$          b) $-\frac{1}{2}$          c) 2          d) $-2$          e) $\frac{1}{3}$

21. Use the change of base formula to evaluate $\log_4 6$. Round the answer to four decimal places.

a) 1.6628          b) 0.7737          c) 3.6124          d) 1.2925          e) 3.1126

22. Simplify $\ln e^{6/5}$.

a) $\frac{5}{6}$          b) $\frac{6}{5}$          c) $e^{6/5}$          d) 1          e) $\frac{6}{5}e$

23. Solve $|3x - 2| = 5$.

a) $\{-1\}$          b) $\left\{-1, \dfrac{7}{3}\right\}$          c) $\left\{\dfrac{7}{3}\right\}$          d) $\left\{-\dfrac{7}{3}, -1\right\}$          e) $\left\{1, \dfrac{7}{3}\right\}$

24. Find the value of $x$ in the solution for the following system $\begin{cases} 3x - y = 5 \\ 2x + 3y = -4 \end{cases}$.

a) 0          b) $-2$          c) 1          d) 3          e) none of these

4

25. Which types of symmetry does the graph of $7y^2 = 4x^3 - 5$ possess?

    a) $x$-axis only       b) $y$-axis only       c) origin only    d) $x$-axis, $y$-axis, origin    e) no symmetry

26. Which equation can be used to determine how long it will it take a \$1000 investment to double if it is invested at 6% interest compounded continuously?

    Compound interest formulas: $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$.

    a) $2000 = 1000(1.06)^{t}$           b) $1000 = 2000(1.06)^{t}$           c) $1000 = 2000e^{0.06\,t}$

    d) $2 = 1000e^{0.06\,t}$              e) $2000 = 1000e^{0.06\,t}$

27. Find the accumulated value of an investment of \$5000 after 10 years at an interest rate of 6.3% if the interest is compounded continuously. Round the answer to the nearest dollar.

    Compound interest formulas: $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$.

    a) \$53251        b) \$9210        c) \$9388        d) \$8150        e) \$5325

28. A sum of \$3500 is invested at an annual rate of 8%. Find the balance in the account after 5 years subject to quarterly compounding. Round to the nearest dollar.

    Compound interest formulas: $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$.

    a) \$5201        b) \$4900        c) \$5143        d) \$5181        e) \$5221

29. Which of the following most resembles the graph of $f(x) = \log_2(x-1)$?

    a)                    b)                    c)                    d)                    e)
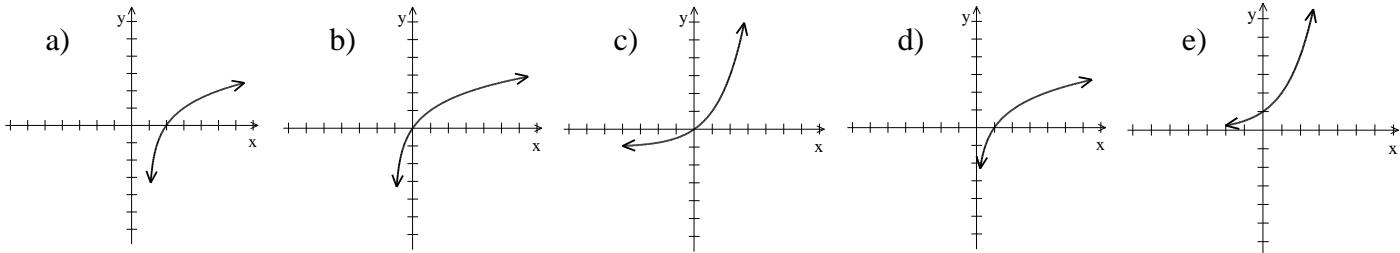
30. Expand $\log_7\left(\dfrac{\sqrt[5]{9}}{a^4 b}\right)$.

 a) $\log_7 9 - 4\log_7 a - 4\log_7 b$  b) $\dfrac{1}{5}\log_7 9 - 4\log_7 a - \log_7 b$  c) $\dfrac{1}{5}\log_7 9 - 4\log_7 a + \log_7 b$

 d) $5\log_7 9 - 4\log_7 a - \log_7 b$  e) $5\log_7 9 - 4\log_7 a + \log_7 b$

31. Let $f(x) = \dfrac{2}{x-3}$. Find $f^{-1}(x)$.

 a) $f^{-1}(x) = 3 + \dfrac{2}{x}$  b) $f^{-1}(x) = \dfrac{2}{x} - 3$  c) $f^{-1}(x) = \dfrac{x+3}{2}$

 d) $f^{-1}(x) = \dfrac{x-3}{2}$  e) $f^{-1}(x) = \dfrac{3}{x} - 2$

32. Let $f(x) = 2x^2 - 2x + 1$. Find and simplify $\dfrac{f(x+h) - f(x)}{h}$.

 a) $4x + 2h + 2$  b) $4x + 2h - 2$  c) $2x + 2h - 2$  d) $2x + h - 2$  e) $1$

33. Solve $32^{2x} = \left(\dfrac{1}{2}\right)^{5x-1}$.

 a) $\left\{\dfrac{1}{5}\right\}$  b) $\left\{-\dfrac{1}{5}\right\}$  c) $\left\{\dfrac{1}{15}\right\}$  d) $\left\{-\dfrac{1}{15}\right\}$  e) none of these

34. Solve $3\ln(4x) = 6$.

 a) $\{e^2\}$  b) $\{e^{1/2}\}$  c) $\left\{\dfrac{e^2}{4}\right\}$  d) $\left\{\dfrac{2}{\ln 4}\right\}$  e) $\{\ \}$

35. Find the $x$-intercepts for the graph of $f(x) = 3x^2 - 2x + 1$.

 a) $(-1, 0)$ and $(3, 0)$  b) $\left(\dfrac{1 \pm \sqrt{2}}{3}, 0\right)$  c) $\left(\dfrac{2 \pm \sqrt{14}}{6}, 0\right)$

 d) $\left(-\dfrac{1}{3}, 0\right)$ and $(1, 0)$  e) no $x$-intercepts

6

36. Find the domain of $f(x) = \log(x + 5)$.

   a) $(-\infty, -5)$          b) $(-\infty, -5]$          c) $(-5, \infty)$          d) $[-5, \infty)$          e) $(0, \infty)$

37. Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions.

   $\log_3\left(81x^2\right)$

   a) $\log_3(81)\log_3\left(x^2\right)$          b) $4 + 2\log_3 x$          c) $4\log_3\left(x^2\right)$

   d) $\log_3\left(81 + x^2\right)$          e) $\log_3 81 - 2\log_3 x$

38. $\dfrac{1}{2}\log_b y - 4\log_b x - \log_b z$ equals:

   a) $\log_b\left(\dfrac{1}{2}y - 4x - z\right)$          b) $\log_b\left(\sqrt{y} - x^4 - z\right)$          c) $\log_b \dfrac{z\sqrt{y}}{x^4}$

   d) $\log_b \dfrac{\sqrt{y}}{x^4 z}$          e) $\dfrac{\log_b \sqrt{y}}{\log_b x^4 - \log_b z}$

39. If $f(x) = \dfrac{9}{x + 12}$ and $g(x) = \sqrt{x}$, find $(g \circ f)(4)$.

   a) $\dfrac{3}{4}$          b) $\dfrac{9}{14}$          c) $\dfrac{9}{8}$          d) $\dfrac{9}{16}$          e) none of these

40. Which of the following is the graph of $f(x) = 2^{-x}$?

   a)          b)          c)          d)          e)

7
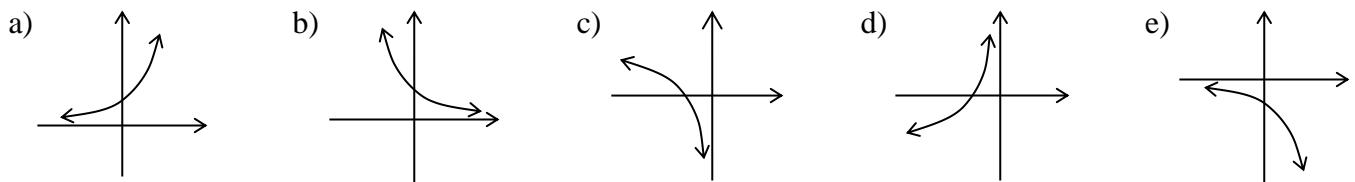
41. If $f(x) = \begin{cases} 2x+3 & \text{for } x \le -1 \\ 1-5x & \text{for } x > -1 \end{cases}$, find $f(-1)$.

    a) 6                 b) 5                 c) 1                 d) $-4$               e) none of these

42. Which of the following functions is odd?

    a) $f(x) = x^2 + 4$       b) $f(x) = x^3 + 4$       c) $f(x) = x^2 + 4x$       d) $f(x) = x^3 + 4x$       e) $f(x) = x + 4$

43. Which of the following is the graph of $f(x) = -2x^3$?

    a)                 b)                 c)                 d)                 e)
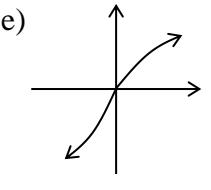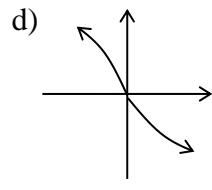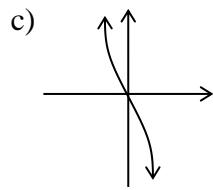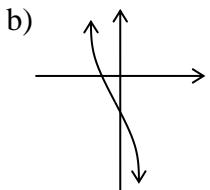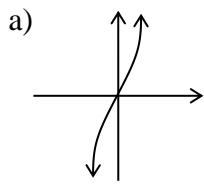
44. Solve $\ln(5t + 1) - \ln(t + 2) = \ln 3$.

    a) $\{1\}$                 b) $\{0\}$                 c) $\left\{\dfrac{3}{2}\right\}$             d) $\left\{\dfrac{5}{2}\right\}$            e) { }

45. The graph of $y = f(x)$ is       . Which of the following is the graph of $y = f(x) - 3$?

    a)                 b)                 c)                 d)                 e)
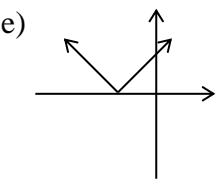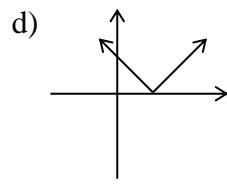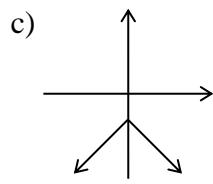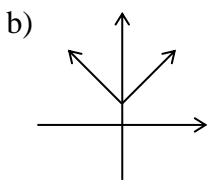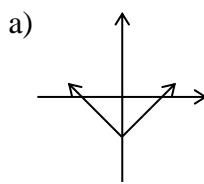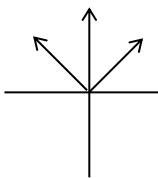
46. Solve $\log x + \log(2x + 1) = 1$.

    a) $\left\{\dfrac{1}{2}\right\}$            b) $\left\{\dfrac{5}{2}, 2\right\}$         c) $\left\{-\dfrac{5}{2}, 2\right\}$        d) $\left\{-1, \dfrac{1}{2}\right\}$        e) $\{2\}$

47. Which of the following is the equation of the asymptote for the graph of $f(x) = 2^{x+3}$ ?

a) $x = 3$      b) $x = -3$      c) $y = 3$      d) $y = -3$      e) $y = 0$

48. Graph $f(x) = (x - 2)^2 - 3$

a)

b)

c)

d)

49. Graph $f(x) = -3x^2 + 6x + 3$.

a)

b)

c)

d)
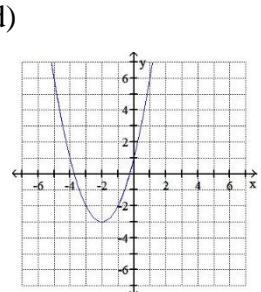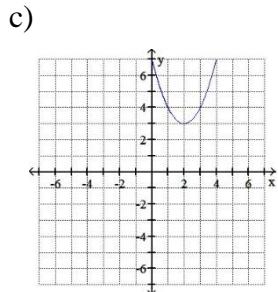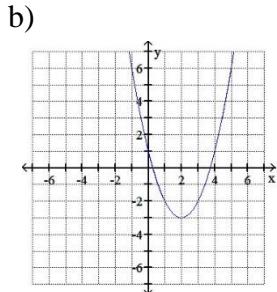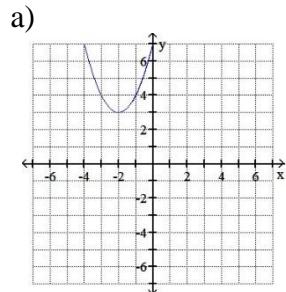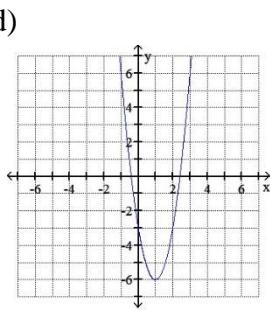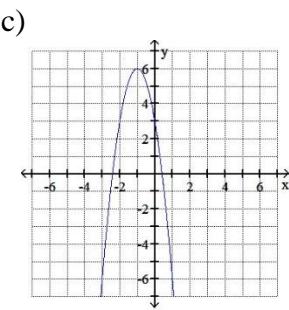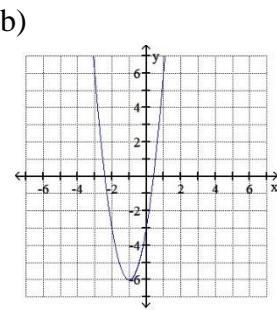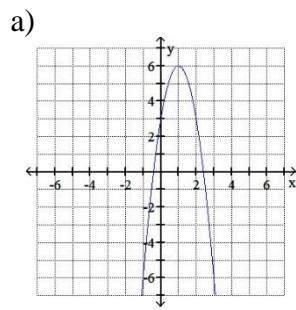
50. Graph $f(x) = \begin{cases} 3 & \text{for } x < 1 \\ 1 - 2x & \text{for } x \geq 1 \end{cases}$.

a)

b)

c)

d)

e)

9
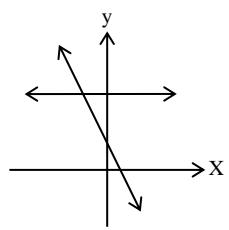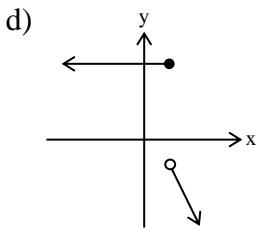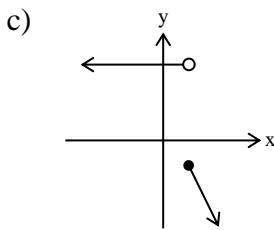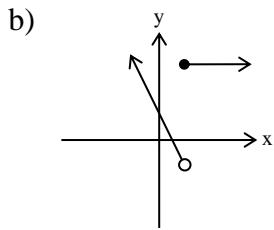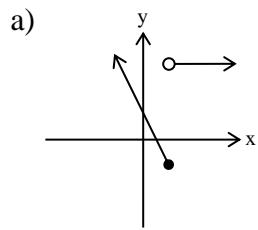
<u>Answers</u>:

| | | |
|---|---|---|
| 1. d | 18. b | 35. e |
| 2. e | 19. c | 36. c |
| 3. b | 20. d | 37. b |
| 4. e | 21. d | 38. d |
| 5. a | 22. b | 39. a |
| 6. b | 23. b | 40. b |
| 7. c | 24. c | 41. c |
| 8. e | 25. a | 42. d |
| 9. b | 26. e | 43. c |
| 10. e | 27. c | 44. d |
| 11. c | 28. a | 45. a |
| 12. b | 29. a | 46. e |
| 13. c | 30. b | 47. e |
| 14. e | 31. a | 48. b |
| 15. c | 32. b | 49. a |
| 16. c | 33. c | 50. c |
| 17. c | 34. c | |