1. What is the solution set for $x$: $x2 + 3x + 2 > 0$?
    a. $x > -1$
    b. $x < -2$
    c. $x > -1$ or $x < -2$
    d. $x < -1$ and $x > -2$
    e. $x > -2$
2. If $(e2x) = 3$, then what does $e6x$ equal?
    a. 6
    b. 9
    c. 18
    d. 27
    e. 81
3. Which of the following is the equation for the axis of symmetry for $2x2 - 6x + 5 = y$ ?
    a. $x = -6$
    b. $x = -3$
    c. $x = -\frac{3}{2}$
    d. $x = \frac{3}{2}$
    e. $x = \frac{1}{3}$
4. A two digit number, whose sum of digits is ten, will be 36 less than the original number when the digits are reversed. What is the original number?
    a. 28
    b. 37
    c. 46
    d. 64
    e. 73
5. What is the solution set for $2\sqrt{x} = x - 8$?
    a. $x = 16$ and $x = 4$
    b. $x = 16$
    c. $x = 4$
    d. $x = 16$ and $x = 64$
    e. $x = 64$
6. What is the value of $9^{-\frac{3}{2}} - 8^{\frac{2}{3}}$?
    a. $\frac{1}{72}$
    b. $-72$
    c. $-\frac{4}{27}$
    d. $\frac{4}{27}$
    e. $-108$

7. What is the remainder after dividing $2x^2 - x + 2 \overline{\smash{)}8x^4 + 6x^2 - 3x + 1}$?
    a. $-x - 1$
    b. $-7x + 1$
    c. $-7x - 1$
    d. $5x + 1$
    e. $5x - 1$
8. Which is the value of $(6 + 3i)-1$ , in a + bi form, without exponents?
    a. $-6 - 3i$
    b. $\frac{1}{6} + \frac{1}{3}i$
    c. $\frac{2-i}{15}$
    d. $\frac{2-i}{9}$
    e. $6 - 3i$
9. A third degree equation with rational coefficients has $x = -2$ and $x = 1 + 2i$ as roots. Which is this polynomial with lowest coefficients?
    a. $x3 - 4x2 - 3x + 18$
    b. $x3 - 8x2 + 21x - 18$
    c. $x3 - x + 6$
    d. $x3 + x + 10$
    e. $x3 + 2x2 + x + 2$
10. Which is the solution for $x$: $\log(x + 4) + \log(x + 1) = 1$?
    a. $x = 1$
    b. $x = -6$
    c. $x = 1$ or $x = -6$
    d. $x = -3$ or $x = 0$
    e. $x = 0$

# Answers

1. C. When working with quadratic inequalities, it is first necessary to factor the quadratic.$x2 + 3x + 2 > 0$ becomes $(x + 2)(x + 1) > 0$. A product of two numbers can only be positive when the factors are either both positive or both negative.
    a. For both factors to be positive: $x + 2 > 0$ AND $x + 1 > 0$. That is, $x > -2$ AND $x > -1$. For both of these conditions to be met, $x$ must be greater than $-1$.
    b. For both factors to be negative: $x + 2 < 0$ AND $x + 1 < 0$. That is, $x < -2$ AND $x < -1$. For both of these conditions to be met, $x$ must be less than $-2$.
    c. The solution set is, therefore, $x > -1$ OR $x < -2$.

2. D. Given (e2*x*) = 3. Since (a*n*)*m* = a*nm*, e6*x* can be re-written as (*e*2*x*)3 or 33 which equals 27.
3. D. The equation for the axis of symmetry for a quadratic, *ax*2 + *bx* + *c* = *y*, is . In 2*x*2 − 6*x* + 5 = *y*, *a* = 2, *b* = −6 and *c* = 5. Therefore, the axis of symmetry is  or  .
4. E. Let *t* = the ten's digit number and *u* = the unit's digit number.
   a. Sum of the digits is 10: *t* + *u*= 10

      The value of the original number can be found by 10*t* +*u* The value of the reversed digits number can be found by 10*u* + *t*

   b. The original number minus the reversed number is 36: (10*t* + *u*) - (10*u* + *t*) = 36 or 9*t* − 9*u* = 36. Divide both sides of the equation by 9 to obtain *t*−*u* = 4. Taking *t* + *u* = 10 from (1) above, add both equations to obtain 2*t* + 0 = 14 or *t* = 7. That is, the ten's digit is 7. The unit's digit must be 3 (their sum is 10). Therefore, the original number is 73.
5. B. Square both sides of the equation 2√*x* = *x* − 8 to obtain 4*x* = *x*2 − 16*x* + 64 or

   0 = *x*2 − 20*x* + 64. Factor the quadratic: 0 = (*x* − 4)(*x* − 16), *x* = 4 or *x* =16. You MUST check both results.

   *x* = 4: 2√4 = 4 − 8 yields 4 = −4, which is untrue. Therefore, *x* = 4 is not a viable solution. This is called an "extraneous" solution.

   *x* = 16: 2√16 = 16 − 8 or 8 = 8, which is true. Therefore, *x* = 16 is correct.

6. C. To find the value of  or  , evaluate  and  , separately:  =  or

    or 4

   Multiply  × 4 to obtain the answer,  .

7. B. To find the quotient: $2x^2 - x + 2 \overline{\smash{)}8x^4 + 0x^3 + 6x^2 - 3x + 1}$ ,

   NOTE: All terms, starting with degree 4, must be included in the dividend, hence the insertion of 0*x*3. Now, take the highest degree term in the divisor, 2*x*2, to divide into the highest degree term in the dividend, 8*x*4, to obtain 4*x*2:

   $$\begin{array}{r} 4x^2 + 2x \\ 2x^2 - x + 2 \overline{\smash{)}8x^4 + 0x^3 + 6x^2 - 3x + 1} \end{array}$$ , multiply divisor by 4*x*2

   − (8*x*4 − 4*x*3 + 8*x*2) subtract

$4x3 - 2x2 - 3x$ divide $2x2$ into $4x3$ to obtain $2x$

$- (4x3 - 2x2 + 4x)$ subtract

$-7x + 1$ this is the remainder (since $2x2$ is a higher degree than $-7x$)

8. C. $(6 + 3i)$-1 = $\frac{1}{6+3i}$ . Correct form would eliminate the "$i$" from the denominator. To have the fraction in correct form, multiply numerator and denominator by the complex conjugate of the denominator, which is $6 - 3i$.

   $\frac{1}{6+3i} - \frac{6-3i}{6-3i} = \frac{6-3i}{36-9i^2}$ or $\frac{6-3i}{36-9(-1)} = \frac{6-3i}{45}$

   Since all three parts are divisible by 3, divide each part by three to obtain: $\frac{2-i}{15}$

9. D. Since the coefficients are rational and one root, $1 + 2\,i$, is complex, another root must be its complex conjugate or $1 - 2\,i$. To find the polynomial, multiply the following:

   $(x + 2)(x - [1 + 2i])(x - [1 - 2i])$. To make this process efficient, multiply the last two factors first:

   $(x - [1+ 2i])(x - [1 - 2i]) = x2 - x[1 - 2i] - x[1 + 2i] - [1 + 2i][1 - 2i]$ or

   $x2 - x + 2xi - x - 2xi + 1 - 2i + 2i - 4i2$ or

   $x2 - 2\,x + 1 - 4(-1)$ or $x2 - 2x + 5$

   Now, multiply $(x + 2)(x2 - 2x + 5) = x3 - 2x2 + 5x + 2x2 - 4x + 10$ or $x3 + x + 10$.

10. A. In $\log(x + 4) + \log(x + 1) = 1$, first recognize that the sum of logs means the two values are multiplied or $\log(x + 4)(x + 1) = 1$ (since $\log a + \log b = \log ab$).

    Now, $\log x = a$ is equivalent to $10a = x$:$(x + 4)(x + 1) = 101$ or $x2 + 5x + 4 = 10$

    Subtract 10 from both sides: $x2 + 5x - 6 = 0$

    Factor: $(x - 1)(x + 6) = 0$ or $x = 1$, $x = -6$

    If $x = -6$, the value of the numbers in the log function, $x + 4$ and $x + 1$, will be negative, which is not possible because the value placed in a log MUST be positive. Therefore, the only solution is $x = 1$.