1) If the quadratic equation $2x^2 + kx + k - \dfrac{3}{2} = 0$, has two nonreal complex

roots, then

A) $2 < k < 6$

B) $-2 < k < 3$

C) $k < 3$ or $k > 4$

D) $3 < k < 4$

E) $k < 2$ or $k > 6$

2) The sum of all the solution(s) of the equation
   $(x - 5)(x^3 - 3x^2 - 3x + 12) = (x - 5)x$ is

A)   8

B)   1

C)   3

D) -1

E)   2

3) For $i = \sqrt{-1}$, which ONE of the following is FALSE ?

A) $\sqrt{-5}\,\sqrt{-2} = \sqrt{10}$

B) $i^{4n-1} = -i$ for any positive integer n .

C) $i^{53} = i$

D) $i^{4n} = 1$ for any positive integer n .

E) $\sqrt[3]{(-3)^6}\,\sqrt{(-2)^6} = 72$

4) The range of the function $f(x) = 3 - |x - 1|$ is given by

A) $(-\infty, 3]$

B) $[3, \infty)$

C) $[1, 3]$

D) $(-\infty, 1]$

E) $[1, \infty)$

5) If a and b are nonzero real numbers such that the line $ax + y = b$ is perpendicular to the line $cx + y = b + 2$, then

A) $ac = -1$

B) $ac = 1$

C) $0 < ac < 1$

D) $ac > 1$

E) $ac < -1$

6) The solution set of the inequality $\left| x - 5 \right| \geq -3$ is

A) $(-\infty , \infty)$

B) $(-\infty , -1) \cup (-1, \infty)$

C) $\varnothing$

D) $(-\infty , -8) \cup (2, \infty)$

E) $[2, \infty)$

7) The solution set, in interval notation, of the inequality $\dfrac{x^2 - 4x + 4}{x^2 - 9} \geq 0$ is

   A) $(- \infty, - 3) \cup (3, \infty) \cup \{2\}$

   B) $(- \infty, - 3) \cup [2, \infty)$

   C) $(- 3, 3)$

   D) $(- \infty, - 3) \cup (3, \infty)$

   E) $(- \infty, 2] \cup (3, \infty)$

8) The solution set of the equation $\dfrac{1}{x + 6} - \dfrac{|4x - 7|}{x^2 + 5x - 6} = \dfrac{1}{x - 1}$ consists of

   A)   no real solution.

   B)   exactly one positive real solution.

   C)   exactly two positive real solutions.

   D)   exactly one negative real solution.

   E)   exactly two negative real solutions.

9) Let $f(x) = x^2 - 2x$. If g is obtained from f by reflecting its graph across the y-axis, shifting 1 unit right and then 1 unit upward, then $g(x) =$

A) x^2

B) $-x^2 + 2x + 2$

C) $x^2 + 2x$

D) $x^2 + 2x + 4$

E) $-x^2 + 2x - 1$

10) Which ONE of the following relations defines y as a function of x?

A) $x^2 + \sqrt[3]{y} + 1 = 0$

B) $x + y^2 = 1$

C) $x - \sqrt{y^2} + 1 = 0$

D) $|y| = |x|$

E) $y^2 + \sqrt[3]{x} + 1 = 0$

11) Which ONE of the following is TRUE about the functions

$f(x) = x(x + 1)(x - 1)$ and $g(x) = x\sqrt[3]{x}$?

A) f is odd and g is even

B) f is even and g is even

C) f is odd and g is neither odd nor even

D) f is odd and g is odd

E) f is even and g is odd

12) Given the function $f(x) = \begin{cases} [\![x + 1]\!] & \text{if} & x \geq 0 \\ |x| - 1 & \text{if} & x < 0 \end{cases}$, where

$[\![\ \ ]\!]$ denotes the greatest integer function, then $(f \circ f)(-\pi) =$

A)   3

B) $\pi + 1$

C) π

D)   4

E)   2

13) Let $i = \sqrt{-1}$. If $\left(\sqrt{2} - \sqrt{-2}\right)\left(\sqrt{8} + \sqrt{-2}\right) + \sqrt[3]{-8} = a + bi$, then $a + b =$

A)   2

B)   9

C)   - 3

D)   - 9

E)   3

14) The length of a rectangle is one meter more than twice the width. If the area of the rectangle is 6 square meters, then its length in meters is

A)   4

B)   2

C)   3

D)   1

E)   5

15) If $f(x) = \sqrt[4]{x + 1}$, $g(x) = x^3 + 2x^2 + x$ and the domain of $\dfrac{f}{g}$ is

$(a, b) \cup (b, \infty)$, then $a + b =$

A)   - 1

B)   2

C)   - 2

D)   1

E)   0

16) The sum of all the solution(s) of the equation $\left(\dfrac{x - 1}{x}\right)^2 - \left(\dfrac{x - 1}{x}\right) = 2$

is

A) $-\dfrac{1}{2}$

B)   1

C)   2

D) $\dfrac{1}{2}$

E) $-\dfrac{7}{2}$

17) If f is a linear function such that $f(2) = 6$, $f(k) = 15$ and its graph is parallel to the line $3x + 2y + 4 = 0$, then $k =$

A) -4

B)   7

C)   4

D) -12

E) -7

18) Given the function $f(x) = \begin{cases} 2x - 1 & \text{if} \quad x \le 1 \\ x^2 & \text{if} \quad x > 1 \end{cases}$ and $h > 0$, then

$$\frac{f(1 + h) - f(1)}{h} =$$

A) $h + 2$

B) $2h$

C) $h - 2$

D) $-h$

E) h

19) If $(f \circ g)(x) = x^2 + \dfrac{1}{x^2} - 4$ and $g(x) = x - \dfrac{1}{x}$, then $f(3) =$

     A)   7

     B)   3

     C)   9

     D)   1

     E)   5

20) If $Z = \dfrac{(2 + i)^2}{i^7}$

     A) $-4 - 3i$

     B) $3i$

     C) $-3i$

     D) $4 - 3i$

     E) $-4 + 3i$

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) A
15) A
16) A
17) A
18) A
19) A
20) A