1) If $A = \{x \mid x$ is an even integer between -1 and $7\}$ and $B = \{0, 1, 3, 4, 5, 6\}$, then $A \cap B =$

A) $\{0, 4, 6\}$

B) $\{0, 6\}$

C) $\{4, 6\}$

D) $\{1, 2, 3, 4, 5, 6\}$

E) $\{0, 1, 2, 3, 4, 5, 6\}$

2) If $x > 0$, $y > 0$ and $\dfrac{\left(y^2\right)^{-1/2}}{\left(4^{-1} x^2 y^4\right)^{1/2}} = Kx^R y^S$, then $K + R + S =$

A) -2

B) -3

C) 0

D) -4

E) 1

3) The expression $\left(a^2 + b^2\right)^2 - \left(a^2 - b^2\right)^2$ simplifies to

   A) $4\, a^2\, b^2$

   B) $2\, a^2\, b^2$

   C) $2\, a^2$

   D) $4\, a^4\, b^4$

   E) $2\, a^4\, b^4$

4) One factor of the polynomial $(x^2 - 1)^2 + (x^2 - 1) - 12$ is

   A) $x + 2$

   B) $x - 1$

   C) $x + 1$

   D) $x + 3$

   E) $x - 3$

5) If the difference between 5 times a number and 7 is equal to the sum of the number and 3 , then the number is

A) $\dfrac{5}{2}$

B) $\dfrac{5}{3}$

C)   - 3

D)   - 8

E)   - 1

6) If the point $(-1, c)$, $c > 0$, is 5 units from the point $(-4, 0)$, then $2c + 1 =$

A)   9

B)   7

C)   5

D)   11

E)   13

7) The equation of the circle having a diameter with endpoints (- 5, 3) and
    (1, 5) , is

    A) $x^2 + y^2 + 4x - 8y + 10 = 0$

    B) $x^2 + y^2 - 4x + 8y - 10 = 0$

    C) $x^2 + y^2 - 4x + 8y + 10 = 0$

    D) $x^2 + y^2 + 4x - 8y - 10 = 0$

    E) $x^2 + y^2 - 4x - 8y - 10 = 0$

8) The equation of the line passing through (-3, - 5) and perpendicular to
    a line with zero slope is

    A) $x = -3$

    B) $y = -5$

    C) $y = 5$

    D) $x = \dfrac{1}{3}$

    E) $y = \dfrac{1}{5}$

9) If $z = -\sqrt{-2^2} + \dfrac{1 - 3i}{1 + i}$, where $i = \sqrt{-1}$, then the conjugate of z is

A) $-1 + 4i$

B) $1 - 4i$

C) $1 + 4i$

D) -1

E) 1

10) The values of k , in interval notation, for which the equation

$x^2 + kx + 3k = 5$ has NO real solution, is

A) $(2, 10)$

B) $(0, \ 2)$

C) $(0, 12)$

D) $(-\infty, 2) \cup (10, \infty)$

E) $(-\infty, 0) \cup (12, \infty)$

11) The solution set of the inequality $\;8 + 3\left| x - \dfrac{1}{2} \right| \geq 2\;$ is

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

    B) $\left(-\infty, \; -\dfrac{3}{2}\right] \cup \left[\dfrac{5}{2}, \; \infty\right)$

    C) $\left[-\dfrac{3}{2}, \; \dfrac{5}{2}\right]$

    D) $(-\infty, \; 0) \cup (0, \; \infty)$

    E) $\varnothing$

12) The domain D and the range R of the function $\;f(x) = 2 - \sqrt{6 - 3x}\;$ are respectively given by

    A) $D = (-\infty, \; 2]$ and $R = (-\infty, \; 2]$

    B) $D = (-\infty, \; 2]$ and $R = [2, \; \infty)$

    C) $D = (-\infty, \; 2]$ and $R = [2, \; 6]$

    D) $D = [2, \; \infty)$ and $R = [2, \; \infty)$

    E) $D = [2, \; \infty)$ and $R = (-\infty, \; 2]$

13) If $f(x) = x^3 - 1$ and $h \neq 0$, then $\dfrac{f(2 + h) - f(2)}{h} =$

A) $h^2 + 6h + 12$

B) $h^2 + 6h + 14$

C) h^2

D) $h^2 - \dfrac{2}{h}$

E) $h^2 + 6h$

14) If $f(x) = \begin{cases} -x^2 + 6 & \text{if } x < -3 \\ |2 + 5x| & \text{if } -3 \leq x < 1, \\ [\![3x - 4]\!] & \text{if } x \geq 1 \end{cases}$ where $[\![\ ]\!]$ denotes the

greatest integer function, then $f(\pi) - f(-2) =$

A) -3

B) 13

C) 0

D) 7

E) -7

15) Let $y = f(x)$ be a linear function with $f(1) = 5$ and $f(k) = 15$. If the graph of f is parallel to the line $2x + y = 3$, then $k =$

A) -4

B) 2

C) 3

D) -2

E) 4

16) If the graph of the function $f(x) = 1 - \sqrt{x - 1}$ is reflected across the y-axis, then shifted 2 units to the right and 3 units upward, then the equation for the new graph is

A) $y = 4 - \sqrt{-x + 1}$

B) $y = 4 - \sqrt{-x - 1}$

C) $y = 4 - \sqrt{-x - 3}$

D) $y = 4 - \sqrt{-x + 3}$

E) $y = 4 - \sqrt{-x - 2}$

17) Which one of the following is an even function ?

A) $h(x) = \dfrac{\sqrt[3]{x}}{x^3 - x}$

B) $h(x) = x + \dfrac{1}{x}$

C) $h(x) = 3 - \sqrt[3]{x}$

D) $h(x) = |x| - x$

E) $h(x) = x^2 + x$

18) If $f(x) = \sqrt{x}$ and $g(x) = \sqrt{9 - x^2}$,   then the domain of the

function $\left(\dfrac{f}{g} \right)(x)$, in interval notation, is

A) $[\, 0,\ 3\,)$

B) $(-\, 3,\, 0)$

C) $(-\, 3,\, 3)$

D) $[\, 0,\ 3\,]$

E) $(-\, 3,\, 0]$

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

A)   1

B)   - 1

C) $\dfrac{5}{3}$

D)   - 4

E)   4

20) The range of the function $f(x) = -\dfrac{1}{3}x^2 + 2x + 7$, is

A) $(-\infty, 10\,]$

B) $(-\infty, 3\,]$

C) $(-\infty, 7\,]$

D) $[\,10, \infty)$

E) $[\,3, \infty)$

21) Given the function $f(x) = x^2 + 4x + 2$ with domain $[-3, -2]$, then the maximum value of the graph of $f(x)$ is

A) -1

B) 2

C) 0

D) -2

E) NO maxumum value

22) The graph of $f(x) = -x^3 + 3x^2 + 9x - 27$ lies above the x-axis on the interval

A) $(-\infty, -3)$

B) $(-3, 3)$

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

D) $(-\infty, 3)$

E) $(-3, \infty)$

23)   If $\dfrac{8x^4 + 6x^2 - 3x + 1}{2x^2 - x + 2} = Q(x) + \dfrac{ax + b}{2x^2 - x + 2}$,   then $a + b =$

A)   - 6

B)   7

C)   - 8

D)   5

E)   3

24)   If $a + bi$ is the remainder when $P(x) = x^{21} - 8x^{15} + x^6$ is divided by $x + i$, then $a + b =$

A)   - 10

B)   6

C)   - 8

D)   - 6

E)   8

25) According to Descartes rule of signs, $P(x) = x^6 + 3x^5 + x^3 - x - 1$ has a total of either

A) two or four real zeros

B) four or six real zeros

C) two or four or six real zeros

D) one or five real zeros

E) one or three or five real zeros

26) The number of all the x-intercept(s) of the graph of the polynomial function $P(x) = x^5 + x^4 - 2x^3 - 2x^2 + x + 1$, is

A) 2

B) 1

C) 3

D) 4

E) 0

27) If -1 is a zero of multiplicity 2 of $P(x) = x^4 + 6x^3 + 14x^2 + 14x + k$

for some constant k, then the remaining zeros are

A) $-2 \pm i$

B) $-2 \pm 2i$

C) $2 \pm i\sqrt{5}$

D) $2 \pm i$

E) $-2 \pm i\sqrt{5}$

28) If $3i$ is a zero of the polynomial function $g(x) = 2x^4 - x^3 + 12x^2 - 9x - 54$,

then the product of all real zeros of $g(x)$ is equal to

A) -3

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

C) $\dfrac{3}{2}$

D) 9

E) -6

29) If $y = 3$ is the horizontal asymptote of the function $f(x) = \dfrac{ax + 12}{2x - 5}$,

then the x-intercept of the graph of f is

A)   - 2

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

C) $\dfrac{5}{2}$

D)   3

E)   6

30) If $x = 2$ is the vertical asymptote of the function $r(x) = \dfrac{3 - (a + 1)x}{4 - ax}$,

then its horizontal asymptote is

A) $y = \dfrac{3}{2}$

B) $y = -\dfrac{2}{3}$

C) $y = \dfrac{3}{4}$

D) $y = 3$

E) $y = 2$