Q1.

The polynomial $P(x) = x^4 + 2x^3 - 8x^2 - 20x - 20$ has a zero between

A) 0 and 1

B) 4 and 5

C) 2 and 3

D) 1 and 2

E) 3 and 4

Q2.

The graph of $y = \dfrac{3x^4 + 4}{x^3 + 3x}$ intersects its slant asymptote at

A) $(\frac{2}{3}, -2)$

B) $(\frac{2}{3}, 2)$

C) $(-2, -\frac{2}{3})$

D) $(-\frac{2}{3}, 2)$

E) $(2, \frac{2}{3})$

Q3.

If $x = 2 - i$ is a zero of the polynomial $p(x) = x^4 - 6x^3 + 10x^2 + 2x - 15$ then the sum of the **remaining** real zeros of $p(x)$ is

A) 4

B) 0

C) −4

D) 2

E) 3

Q4.

The standard form of the complex number $\dfrac{(5+2i)(2-3i)}{5-i}$ is

A) $\dfrac{91}{26} + \dfrac{39}{26}i$

B) $\dfrac{69}{26} - \dfrac{39}{26}i$

C) $\dfrac{69}{26} + \dfrac{39}{26}i$

D) $\dfrac{91}{24} - \dfrac{39}{24}i$

E) $\dfrac{91}{26} - \dfrac{39}{26}i$

Q5.

If we solve the equation $\frac{b+c}{x+a}=\frac{b-c}{x-a}$ for x, we find

A) $x=\frac{ab}{c}$

B) $x=\frac{(x-a)(b+c)}{b-c}$

C) $x=\frac{b-c}{b+c}$

D) $x=\frac{(x+a)(b-c)}{b+c}+a$

E) $x=\frac{2a-2c}{b}$

Q6.

If the polynomial $P(x)=6x^3-16x^2+23x-5$ is divided by $3x-2$, then the sum of the remainder and the quotient is

A) $2x^2+4x$

B) $2x^2-4x$

C) $2(x^2-2x+5)$

D) $2x^2-4x-10$

E) $2x^2+4x+10$

Q7.
If $\left(\frac{x}{3}, \frac{3}{2}\right)$ is the midpoint of the line segment joining the points $(6,2y)$ and $\left(-\frac{4}{3}, \frac{7}{2}\right)$, then $x+y=$

A) $\frac{27}{4}$

B) $\frac{19}{4}$

C) $\frac{15}{2}$

D) $\frac{14}{3}$

E) $\frac{17}{6}$

Q8.
If 2 is a zero of multiplicity 2 of $P(x)=6x^4+ax^3-2x^2+44x+b$, then $a=$

A) 25

B) -33

C) -25

D) -15

E) -19

Q9.
The absolute value notation which describes the statement "the distance between $-a$ and $-b$ is not less than 3" is

A) $|a+b|>3$

B) $|-a-b|<3$

C) $|a-b|\geq 3$

D) $|a+b|\leq 3$

E) $|a-b|\leq 3$

Q10.

The expression $\dfrac{(2a^{1/3}b^{3/2})(-6a^{-1/5}b^{-3/4})}{(3a^{3/5}b^{1/5})(4a^{2/3}b^{1/2})}$ simplifies to

A) $a^{7/15}b$

B) $-a^{-17/15}b$

C) $-a^{-17/15}b^{1/20}$

D) $-a^{-12/15}b^{2}$

E) $a^{7/15}b^{2}$

Q11.

If $f(x)=\dfrac{3x}{x-2}$, then the inverse function $f^{-1}(x)=$

A) x

B) $\dfrac{2x}{x-3}$

C) $\dfrac{2x}{x-2}$

D) $\dfrac{x-3}{3x}$

E) $\dfrac{3x}{x-3}$

Q12.

One factor of $8x^2-26xy+15y^2$ is

A) $2x-3y$

B) $4x+3y$

C) $4x-3y$

D) $4x-5y$

E) $2x+5y$

Q13.
The coefficient of x^4 in the product $(3x^2-2)^3(2x^2-3)$ is

A) 162

B) 269

C) 108

D) 234

E) 72

Q14.
If $P(x)=x^3-18x^2+19x-37$, then $P(17)=$

A) 1

B) -3

C) 2

D) -2

E) -1

Q15.

The graph of the function $f(x)=\dfrac{(x+1)(x+3)}{(x+6)(x-2)}$ is

A) decreasing on $(-6,-3)$

B) increasing on $(-\infty,-6)$

C) below the x-axis on $(-\infty,-6)$

D) over the x-axis on $(-6,-3)$

E) increasing on $(2,\infty)$

Q16.

If (a,b) and (c,d) are two points at which the graph of $f(x)=\dfrac{x^3+x^2+4x+1}{x^3+1}$ intersects its horizontal asymptote, then $a+b+c+d=$

A) 3

B) -2

C) -3

D) 1

E) -1

Q17.

If the solution set of the inequality $|2-4x| \le 2$ is equal to $[m,n]$ and the solution set of the inequality $\frac{4x+1}{3} > 7 - \frac{x}{3}$ is equal to (k,∞), then $m+n+k=$

A) 0

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

C) 5

D) $\frac{3}{2}$

E) 3

Q18.

The graph of $f(x) = -x^3 - 2x^2 + 3x$ is above or on the x-axis on

A) $(-3, 1) \cup (1, \infty)$

B) $(-3, -1) \cup (0, 1)$

C) $(-\infty, -3] \cup [0, 1]$

D) $(-3, -1) \cup (1, \infty)$

E) $(-\infty, -3) \cup (1, \infty)$

Q19.

The minimum value of the function $f(x) = (2x - 1)(x + 3) - 4$ is at $x =$

A) $\frac{7}{4}$

B) $-\frac{5}{4}$

C) $-\frac{7}{4}$

D) $-\frac{5}{2}$

E) $\frac{5}{2}$

Q20.

Which one of the following is a factor of $P(x) = x^3 + x^2 + x - 14$?

A) $x - 1$

B) $x - 7$

C) $x + 2$

D) $x - 2$

E) $x + 1$

Q21.

If $x = \dfrac{5-\sqrt{21}}{2}$, then $x + \dfrac{1}{x}$ is equal to

A) $5+\sqrt{21}$

B) 23

C) 10

D) 5

E) $5-\sqrt{21}$

Q22.

The expression $\dfrac{x-y}{xy} + \dfrac{x-z}{xz} - \dfrac{z-y}{yz}$ simplifies to

A) $\dfrac{2(x-z)}{xz}$

B) $\dfrac{2(x-y)}{xy}$

C) $\dfrac{2(x+z)}{xz}$

D) $\dfrac{2(y-z)}{yz}$

E) $\dfrac{2(x+y)}{xy}$

Q23.
The polynomial function f of lowest degree with real coefficients that satisfies the condition $f(2)=5$ and has the zeros 5 and i is

A) $f(x)=x^3+x^2+x-5$

B) $f(x)=-\frac{1}{3}x^3+\frac{5}{3}x^2-\frac{1}{3}x+\frac{5}{3}$

C) $f(x)=-\frac{1}{3}x^3+2x-1$

D) $f(x)=\frac{1}{3}x^3+\frac{5}{3}x^2-\frac{1}{3}x+5$

E) $f(x)=x^2+1$

Q24.
If $f(x)=2x^2-9$, $g(x)=ax+b$ and $(f\circ g)(x)=x^2+4x-5$, then $b^2-a^2=$

A) -8

B) $\frac{5}{2}$

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

D) 3

E) 5

Q25.

If **L** is a line perpendicular to $2y + x = 5$, and both lines pass through the point $(-1,3)$, then the sum of the slopes of the two lines is

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

B) $\frac{1}{2}$

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

D) 0

E) $\frac{3}{2}$

Q26.

The sum of all solutions of the equation $\dfrac{\frac{1}{1-x}+3}{5+\frac{1}{1-x}} = \dfrac{\frac{1}{1-x}-3}{\frac{1}{1-x}-4}$ is

A) 1

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

C) -1

D) 0

E) $\frac{1}{2}$

Q27.

The sum of all solutions of the equation $2x^{1/2} - x^{1/4} = 6$ is

A) 16

B) 8

C) $\frac{175}{16}$

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

E) $\frac{337}{16}$

Q28.

If $f(x) = (x-2)^2 - 4$ and $g(x) = -f(x-2) - \frac{3}{2}$, then $g(x) =$

A) $-(x-4)^2 - \frac{11}{2}$

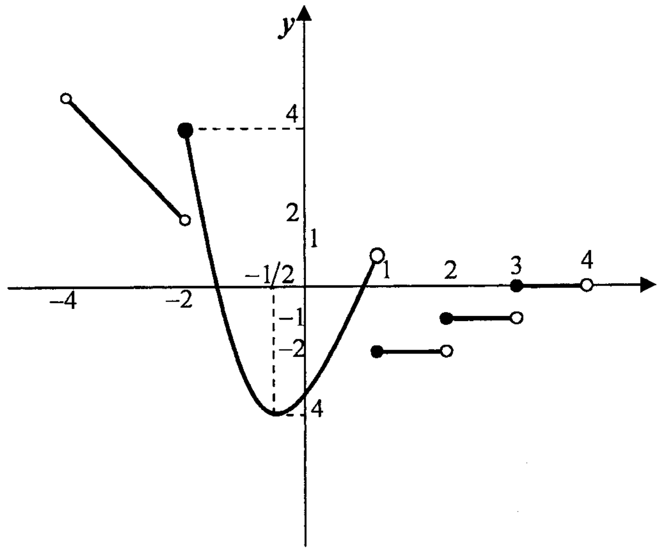
B) $-x^2 + \frac{5}{2}$

C) $-(x-4)^2 + \frac{5}{2}$

D) $-(x-2)^2 - \frac{5}{2}$

E) $-(x-2)^2 + \frac{11}{2}$

Q29.
Which one of the following statements is TRUE for the function whose graph is given below?



A) The function is increasing on $(-1/2,\ 1)$

B) The range of the function $[-4,\ 4]$

C) The domain of the function is $[-2,\ 4)$

D) The function is decreasing on $(-1/2,\ 1)$

E) The function is increasing on $(-\infty,\ -2)$

Q30.
The sum of all values of k for which the equation

$$kx^2 + 2(k+4)x + 25 = 0$$

has exactly one solution is

A) 15

B) −4

C) 7

D) 17

E) −8

Q31.

The expression $x - \dfrac{x}{x + \dfrac{1}{2}}$ can be simplified to

A) $-2x$

B) $2x - 1$

C) $\dfrac{-x}{2x+1}$

D) $\dfrac{x(2x-1)}{2x+1}$

E) x

Q32.

One factor of $16x^{4n} - 8x^{2n} + 1$ is

A) $4x^{n} + 1$

B) $2x^{2n} - 1$

C) $2x^{n} - 1$

D) $2x^{2n} + 1$

E) $4x^{n} - 1$

Q33.
If $f(x) = (x+2)^2(x-3)^3(x^2+1)^2$, then the graph of f

A) crosses the x-axis at $(-1,0)$ and $(1,0)$

B) intersects but dos not cross the x-axis at $(-2,0)$

C) intersects but dos not cross the x-axis at $(3,0)$

D) intersects but dos not cross the x-axis at $(1,0)$ and $(-2,0)$

E) crosses the x-axis at $(3,0)$ and $(-2,0)$

Q34.
The sum of all zeros of $f(x) = 9x^3 + 36x^2 + 41x + 10$ is

A) -5

B) -6

C) -3

D) -4

E) -10

Q35.
The polynomial $P(x) = x^4 - 8x^3 + 24x^2 - 32x + 16$ has

A) Four non-real complex zeros.

B) One rational zero of multiplicity 4.

C) Two rational and two irrational zeros.

D) Two rational zeros and two non-real zeros.

E) Two rational zeros of multiplicity 2 each.

Q36.
The sum of all solutions of the equation $3|x-3| = 7 - x$ is

A) 8

B) 3

C) -2

D) 5

E) -7