LEVEL 5 (PreCalculus) Huddle 2016

1) When the equation $x^2 + y^2 - 8x + 4y - 2 = 0$ is written in the form $(x-h)^2 + (y-k)^2 = C$, then the value of C is

a) -4 b) 4 c) -22 d) 22 e) none of these

2) Given: $f(x) = \frac{2x-1}{x+3}$ and $g(x) = \frac{x+5}{x+3}$. The numerator of $(fg)(3)$ in lowest terms is:

a) 3 b) 9 c) 10 d) 36 e) none of these

3) When the expression $(x+1)^{1/3} + x \cdot \frac{1}{3}(x+1)^{-2/3}$, $x \neq -1$ is written as a single fraction with positive exponents (not rationalized) then the constant term of the numerator is

a) 1 b) 2 c) 3 d) 4 e) none of these

4) The function int(x) is defined as int(x) = the greatest integer less than or equal to x. The value of int$(-\pi)$ is

a) -4 b) -3 c) 4 d) 3 e) none of these

5) The equation of the horizontal asymptote of the graph of $f(x) = \frac{2x^2+2x-4}{x^2-3x-4}$ is

a) $y = -1$ b) $y = 4$ c) $x = -1$ d) $x = 4$ e) none of these

Questions 6-8 are about the function $f(x) = 2x^2(x-2)^2(x-4)^3$

6) The degree of f is

a) 2 b) 3 c) 5 d) 7 e) none of these

7) The product of the multiplicities of the zeros of f is

a) 0 b) 7 c) 8 d) 24 e) none of these

8) An expression that represents the solution of the equation $4^{2x-1} = 7^{x+2}$ is

a) $\frac{\log 4 + 2\log 7}{2\log 4 + \log 7}$ b) $\frac{\log 4 - 2\log 7}{2\log 4 + \log 7}$ c) $\frac{\log 4 - 2\log 7}{2\log 4 - \log 7}$ d) $\frac{\log 4 + \log 49}{\log 16 - \log 7}$ e) none of these

9) If $A = \begin{bmatrix} -1 & 2 & 2 \\ 3 & 0 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 2 & 0 & 1 \\ -3 & 2 & 1 \end{bmatrix}$ then the value in row 2 column 2 of AB is

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

10) The system $xy = 3$, $2x + 2y = 7$ has two solutions. In lowest terms, the denominator of the y value of one of the solutions is

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

11) The value of $\sum_{i=1}^{\infty} 5(\frac{2}{3})^i$ is

a) 10 b) 15 c) $\frac{15}{2}$ d) 30 e) none of these

12) Consider the x^4 term of the expansion of $(2x-1)^6$. The second digit of the constant factor is

a) 2 b) 4 c) 6 d) 0 e) none of these

13) A definition of e is

a) $\lim_{n\to\infty}(1-\frac{1}{n})^n$ b) $\lim_{n\to 0}(1+\frac{1}{n})^n$ c) $\lim_{n\to 0}(n-\frac{1}{n})^n$ d) $\lim_{n\to\infty}(\frac{n+1}{n})^n$ e) none of these

14) In degrees, 2.3 radians is equivalent to

a) 360π b) $\frac{360}{\pi}$ c) $\frac{\pi}{414}$ d) $\frac{5\pi}{414}$ e) none of these

15) If $\cos\theta = -\frac{2}{3}$ and the terminal ray of θ is in quadrant II (standard position) then the denominator of $\cot\theta$ (rationalized and simplified) is

a) 2 or -2 b) 3 or -3 c) 4 or -4 d) 5 or -5 e) none of these

16) The graph of the equation $3x^2+6xy+3y^2-3x+5y-6=0$ is

a) a circle b) a parabola c) an ellipse d) a hyperbola e) none of these

17) If we rotate the axes of the provided equation by the least positive angle θ so the new equation contains no xy term, then the value of $\sin\theta$ is: $(73x^2+72xy+52y^2+30x-40y-75=0)$

a) 0.2 b) 0.6 c) -0.2 d) -0.6 e) none of these

18) If $\sin^4 x$ is written in terms of the first power of the cosine (using the double angle identity twice) then the numerator of the constant term (in lowest terms) is

a) 2 b) 3 c) 4 d) 5 e) none of these

19) If the complex number $Z=4+4i$ is written in polar form, the product of the radius and the angle measure (in degrees) is

a) 720 b) $720\sqrt{2}$ c) 180 d) $180\sqrt{2}$ e) none of these

20) If we use the fact that $\frac{17\pi}{12}=\frac{9\pi}{4}-\frac{5\pi}{6}$ and the $\sin(x-y)$ identity, then the value of $\sin\frac{17\pi}{12}$ (in lowest terms and rationalized) is

a) $\frac{\sqrt{6}+\sqrt{2}}{4}$ b) $\frac{-\sqrt{6}+\sqrt{2}}{4}$ c) $\frac{-\sqrt{6}-\sqrt{2}}{4}$ d) $\frac{\sqrt{6}-\sqrt{2}}{4}$ e) none of these

21) Consider the conic section defined by $r = \frac{10}{3-2\cos\theta}$. The rectangular equation that defines the directrix is

a) $x = \frac{2}{3}$ b) $x = -\frac{2}{3}$ c) $x = 5$ d) $x = 1$ e) none of these

22) The vector that is orthogonal to $9i + 6j$ (where i, j are the standard unit vector) is $\frac{4}{3}i + xj$. The value of the denominator of x is: (x is in lowest terms.)

a) 1 or -1 b) 2 or -2 c) 3 or -3 d) 4 or -4 e) none of these

23) A solution to $\sec 4\theta = 2$ is $\frac{\pi}{x}$ $(0 \leq 4\theta < 2\pi)$. If x is in lowest terms, then a possible denominator of x is

a) 2 b) 3 c) 4 d) 5 e) none of these

24) The graph of $y = \tan(\frac{x}{2} + \frac{\pi}{2})$ has how many x intercepts for two consecutive periods?

a) 1 b) 2 c) 3 d) 4 e) none of these

25) How long is the arc of a 90 unit radius circle that is subtended by a $\frac{50}{\pi}$ degree angle?

a) 25 units b) $\frac{25}{\pi}$ units c) 50 units d) $\frac{50}{\pi}$ units e) none of these

26) A force of 200 pounds is required to push a trailer up a ramp that is inclined 30° from the horizontal. How many pounds does the trailer weigh?

a) 400 b) $100\sqrt{3}$ c) $400\sqrt{3}$ d) $\frac{400}{\sqrt{3}}$ e) none of these

27) If $P = (-3, 1)$ and $Q = (x, 4)$ then the sum of all values of x such that vector PQ has length 5 is

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

28) If $A = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$ then the numerator of the row 1, column 2 element of A^{-1} is

a) -1 b) -2 c) 2 d) 7 e) none of these

29) The value of $\sum_{k=1}^{\infty} 8(\frac{1}{3})^{(k-1)}$ is

a) $\frac{8}{3}$ b) 3 c) $\frac{16}{3}$ d) 12 e) none of these

30) In lowest terms, the numerator of the value of $\cos(2\sin^{-1}\frac{3}{5})$ is

a) 3 b) 5 c) 7 d) 11 e) none of these