PRECALCULUS River Ridge JANUARY REGIONAL

IF NONE OF THE ANSWERS GIVEN IS CORRECT CHOOSE NOTA.

1. Write the equation of the line perpendicular to $2x + y = 5$ and containing the point (3,2).

a) $2x + y = 8$ b) $x + 2y = 7$ c) $x - 2y = 1$ d) $x - 2y = -1$ e) NOTA

2. Simplify $s^3(s^{2k-1})^3$.

a) s^{18k-9} b) $s^{8k^3-12k^2+6k+2}$ c) s^{6k} d) s^{6k-6} e) NOTA

3. When 0.5 cm was planed off each of the six faces of a wooden cube, its volume decreased by 169 cm^3. Find the new volume.

a) 216 b) 312 c) 343 d) 512 e) NOTA

4. Find the measure of θ to the nearest tenth given that $0^\circ \le \theta \le 360^\circ$ and $\cos\theta = 0.7815$ and $\tan\theta < 0$.

a) 38.6° b) 308.6° c) 218.6° d) 321.4° e) NOTA

5. A rectangle is bounded by the x-axis and the semicircle $y = \sqrt{25 - x^2}$. Write the area of the rectangle as a function in x.

a) $A(x) = x\sqrt{25 - x^2}$ b) $A(x) = 2x\sqrt{25 - x^2}$
c) $A(x) = 2x(25-x^2)$ d) $A(x) = x(25-x^2)$ e) NOTA

6. Which best describes a triangle with vertices at the following coordinates: (-1,2), ($\sqrt{3}$ -1,3) and (-1,4)?

a) scalene b) isosceles right c) right d) equilateral e) NOTA

7. What is the probability of drawing five straight diamonds from a standard deck of 52 cards without replacement?

a) $\frac{1}{1024}$ b) $\frac{28,561}{23,990,400}$ c) $\frac{1}{371,293}$ d) $\frac{1,485}{3,655,808}$ e) NOTA

8. A ship at sea is 30 miles from one radio transmitter and 57 miles from another on the same shore. The angle formed by the incoming signals is 43°. How far apart to the nearest tenth are the transmitters?

a) 38.7 b) 40.6 c) 43.4 d) 45.2 e) NOTA

9. If $p = q - \frac{1}{q}$, which statement is false?

a) If q is positive and decreases, then p decreases.
b) If q = 2s, then $2p = \frac{4s^2-1}{s}$.
c) If q is doubled, then p is doubled.
d) If p = 0, the q = 1 or q = -1.
e) NOTA

10. Write $2 = r\cos\left(\theta - \frac{\pi}{4}\right)$ as an equation in rectangular form.

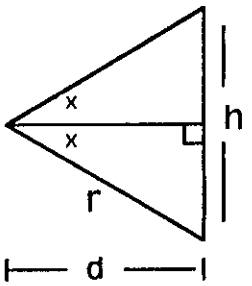
a) $x + y - 2\sqrt{2} = 0$ b) $x - y - 2\sqrt{2} = 0$ c) $\sqrt{2}\,x + \sqrt{2}\,y - 1 = 0$
d) $\sqrt{2}\,x - \sqrt{2}\,y - 1 = 0$ e) NOTA

11. Find the magnitude of the resultant of two vectors that form an angle of 60° and have lengths of 15 cm and 18 cm.

a) $3\sqrt{15}$ b) $3\sqrt{61}$ c) $3\sqrt{91}$ d) $3\sqrt{31}$ e) NOTA

12. Given the triangle at the right which of the following is true?

a) $h = \frac{r}{d}\cos 2x$ b) $h = 2d\tan 2x$
c) $h = \frac{r^2}{d}\sin 2x$ d) $h = \frac{2r}{d}\sin x\cos x$
e) NOTA



13. Given $f(x) = x^3 - x$, find $\frac{f(x) - f(2)}{x - 2}$.

a) $x + 3$ b) $x^2 - 2x + 3$ c) $3x^2 - 1$ d) $x - 3$ e) NOTA

14. 2x is the measure of an angle located in the third quadrant, $0 < 2x < 360°$. In which quadrant does the terminal side for an angle whose measure is $\frac{x}{2}$ lie?

a) I b) II c) III d) IV e) Can't be determined

15. A, B, and C are three consecutive terms of an arithmetic sequence. Their sum is 6 and the sum of their squares is 62. Find A • B • C.

a) -42 b) -21 c) -11 d) -6 e) NOTA

16. An arc is 8.5 cm long and subtends a central angle of 45°. Find the radius of the circle to the nearest tenth.

a) 1.4 b) 10.8 c) 21.6 d) 34.0 e) NOTA

17. If $0 < b < 1$, and $\log_b x - \log_b(x + 1) = 3$, find x in terms of b.

a) $\frac{-1+\sqrt{1+4b^3}}{2}$ b) $\frac{b^3}{1-b^3}$ c) $\frac{1-b^3}{b}$ d) $\frac{1+\sqrt{1-b^3}}{2}$ e) NOTA

18. $\cos(\text{Arcsin}(x + 1)) =$

a) -x b) $\sqrt{1-x^2}$ c) $\sqrt{1-x}$ d) $\sqrt{-x^2-2x}$ e) NOTA

19. If $f(x) = x^2 + px + q$ is exactly divisible by x - a and x - b which of the following must be true?

a) $\frac{p}{q} = \frac{a+b}{ab}$ b) p = a + b and q = -ab c) p = -a - b and q = ab d) p = q + a e) NOTA

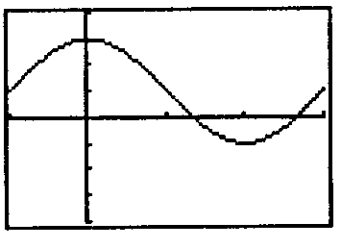
20. A submarine at the surface of the ocean makes an emergency dive. Its path makes an angle of 21° with the surface. If it goes 300 meters along this path, to the nearest tenth how deep will it be?

a) 97.2 b) 107.5 c) 251.0 d) 280.1 e) NOTA

21. Let x be an irrational number. [x] represents the greatest integer value of x. If [x] = 4, find $[-x]^2 + 2[-x] + 1$.

a) -34 b) 9 c) 16 d) 25 e) NOTA

22. For the given period the graph below can be described by the equation y = AsinB(x - C) + D. Each horizontal tick mark represents a unit of $\frac{\pi}{4}$ and each vertical tick mark represents a unit of 1. Find A • B • C • D.



a) $-\pi$ b) $\frac{-\pi^2}{2}$ c) -3π d) $\frac{-\pi^2}{4}$ e) NOTA

23. Write the equation of the parabola with directrix y = 1 and focus (3,-5).

a) $x^2 + 6x - 12y - 33 = 0$ b) $x^2 - 6x + 12y + 33 = 0$
c) $y^2 - 12y + 6x - 33 = 0$ d) $y^2 - 6y + 12x + 33 = 0$ e) NOTA

24. The graph of the curve defined by x = tcos(t) and y = tsin(t) is best described as a

a) cardioid b) rose c) lemniscate d) spiral e) NOTA

25. $\frac{2}{\log_3 a} + \frac{2}{\log_5 a} + \frac{2}{\log_7 a} =$

a) $\log_a 840$ b) $\log_{\sqrt{105}} a$ c) $\log_{\sqrt{a}} 105$ d) $\log_a 11025$ e) NOTA

26. A sphere of radius r is inscribed in a cylinder; that is the sphere touches the cylinder at the top, bottom, and sides. A cone has the same circular base and height as the cylinder. Find the ratio of the volume of the cone to the sphere to the cylinder.

a) 1:3:4 b) 1:2:4 c) 2:3:4 d) 1:9:16 e) NOTA

27. Simplify $\frac{x!(x-3)!}{(x-2)!(x-1)!}$.

a) $\frac{x}{x-1}$ b) $\frac{x-1}{x-2}$ c) $\frac{x^2-x}{x^2-3x-2}$ d) $\frac{x}{x-2}$ e) NOTA

28. A merchant bought 336 sweaters for her shop. She sold the first 300 sweaters for the same amount she paid for the original 336. What was her percent of gain if each of the remaining sweaters sold for the same amount as each of the other 300 sweaters?

a) $10\frac{5}{7}\%$ b) $11\frac{2}{3}\%$ c) 12% d) 33.6% e) NOTA

29. Give the range of the inverse of $f(x) = 2^{\sqrt{x-1}}$.

a) $y \geq 0$ b) $y \geq 1$ c) Reals d) $y \leq 0$ or $y \geq 1$ e) NOTA

30. Given the binomial expansion of $(a + b)^n$ where n is a positive integer, which of the following is false?

a) The sum of the binomial coefficients is 2^n.
b) The coefficient of $a^{n-2}b^2$ is ${}_nC_2$.
c) The expansion has a middle term when n is even.
d) If a term of the expansion is ka^5b^{18}, then n = 13.
e) NOTA