1. Find the area of the region bounded by $r=\frac{8}{4+3\cos\theta}$.

A. 20π	B. 15π	C. $\frac{960}{49}\pi$	D. $\frac{256\sqrt{7}}{49}\pi$	E. NOTA

2. A circle has a radius of 16 feet. If a rhombus is formed by using two radii and two chords of the circle as its sides, find the area enclosed by the rhombus, in square feet.

A. 128	B. $128\sqrt{3}$	C. 256	D. $256\sqrt{3}$	E. NOTA

3. Find the limit of the following: $\lim_{x\to 25}\left(\frac{\int_5^{\sqrt{x}} t^5 dt}{x-25}\right)$

A. 125	B. $\frac{625}{2}$	C. $25\sqrt{5}$	D. 0	E. NOTA

4. At a party, each boy was supposed to shake hands with each of the other boys exactly once, and each girl was supposed to shake hands with each of the other girls exactly once. No members of the opposite sex were supposed to shake hands. If there were more boys than girls at the party and there were 31 handshakes, find the maximum number of boys that attended the party.

A. 4	B. 5	C. 6	D. 7	E. NOTA

5. Given $f(x)=\frac{(2x-4)^5}{(3-x)^6}$, find $f'(1)$.

A. 0	B. -1	C. 1	D. 7	E. NOTA

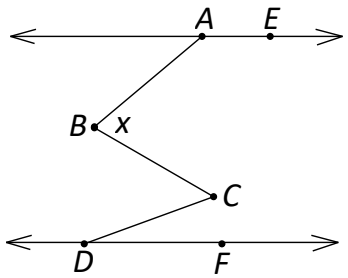
6. A triangle has side lengths 4, 6, and 8. If A = length of the median to the side with length 8 and B = length of the angle bisector to the side with length 6, then find $\frac{B}{A}$.

A. $\frac{2\sqrt{15}}{5}$	B. $\frac{\sqrt{15}}{6}$	C. $\frac{\sqrt{15}}{45}$	D. $3\sqrt{15}$	E. NOTA

7. The roots of $125x^3-900x^2+1755x-756=0$ are in arithmetic progression. Find the sum of the two roots with the least absolute value.

A. 3	B. 12	C. $\frac{11}{15}$	D. $\frac{17}{5}$	E. NOTA

8. If $line\ AE \parallel line\ DF, m\angle BAE = 140°, m\angle BCD = 50°$, and $m\angle CDF = 20°$, then find *x*.



A. 30°	B. 40°	C. 50°	D. 70°	E. NOTA

9. Water is leaking out a cylindrical tank with base radius 3 feet. When there is 36π cubic feet of water in the tank the water is leaking out at a rate of $\frac{9\pi}{5}$ cubic feet per second. How quickly is the depth of the water dropping at that same instant, in feet per second?

A. 4	B. $\frac{1}{4}$	C. 5	D. 0.2	E. NOTA

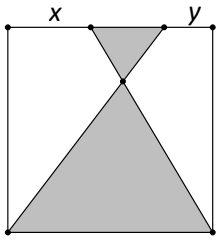
10. The solution interval to $\frac{x+4}{x-2}-\frac{x+1}{x+2}<1$ is $(-\infty, b)\cup(c, d)\cup(e, \infty)$, where $b<c<d<e$. Find the value of $c+e-d^b$.

A. 8	B. $\frac{27}{4}$	C. $\frac{31}{4}$	D. $\frac{29}{4}$	E. NOTA

11. Find the x-coordinate of the point on the parabola $x = y^2$ closest to the point $(0, -3)$.

A. 1	B. -1	C. $\sqrt{2}$	D. 3	E. NOTA

12. The figure below is a square whose enclosed area is 1. If $\frac{x}{y}=7$ and $\frac{\text{Area Large Shaded Triangle}}{\text{Area Small Shaded Triangle}}=9$, find the area of the shaded region.



A. $\frac{5}{12}$	B. $\frac{7}{12}$	C. $\frac{7}{9}$	D. $\frac{5}{14}$	E. NOTA

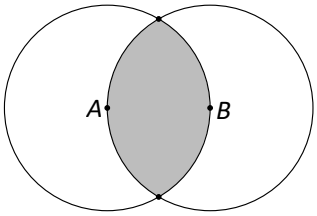
13. Maeby sells frozen bananas for \$4 each. She was told that for each 50-cent increase in price per banana, the total daily sales would decrease by 10 bananas per day (or, for each 50-cent decrease in price per banana, the total daily sales would increase by 10 bananas per day). The stand sells, on average, 60 frozen bananas each day. Maeby ignored the advice and raised the price by \$1. If the price that maximizes revenue is *B*, what is the positive difference between *B* and the new price?

A. \$1.50	B. \$0.25	C. \$0.50	D. \$1.25	E. NOTA

14. Find the arc length of the polar curve $r = 1 + \cos\theta$ on the interval $0 \le \theta \le \pi$.

A. 2π	B. 4π	C. 4	D. 1	E. NOTA

15. Circle $A \cong$ Circle B. $AB = 12$. Find the area of the shaded region.



A. $24\left(4\pi - 3\sqrt{3}\right)$	B. $24\left(4\pi + 3\sqrt{3}\right)$	C. $24\left(2\pi - 3\sqrt{3}\right)$	D. $24\left(4\pi - 3\right)$	E. NOTA

16. Find the sum of the infinite geometric series $9 - 3i - 1 + \frac{1}{3}i + \ldots$, where $i = \sqrt{-1}$.

A. $\frac{81}{10} + \frac{27}{10}i$	B. $\frac{81}{10} - \frac{27}{10}i$	C. $\frac{27}{2}i$	D. $-\frac{27}{2}i$	E. NOTA

17. A sphere with radius 5 cm and a right cone with base radius 5 cm and height 10 cm are lying on a flat table; the cone is resting on its base. The tops are cut parallel to the table surface at the same height for both objects such that the cross-sections formed by the cut have equal areas. How far above the table should the cut be made?

A. $2\sqrt{2} - 1$ cm	B. $\frac{3}{2}$ cm	C. $\sqrt{10}$ cm	D. 2 cm	E. NOTA

18. Given the differential equation $\frac{dy}{dx} = 0.1y + 10$ and an initial value of $y(0) = 300$, find $y(\ln 1024)$

A. 32	B. 400	C. 700	D. 36.2	E. NOTA

19. Find the volume of the parallelepiped with vectors $A = 3i - 5j + k$, $B = 2j - 2k$, and $C = 3i + j + k$ as adjacent edges.

A. 20	B. 24	C. 30	D. 36	E. NOTA

20. Find the volume of the solid created by rotating the region bound by the equations $x = 2 - y^2$ and $x = y^2 - 2$ around the line $x = -2$.

A. $\frac{256\pi\sqrt{2}}{15}$	B. $\frac{64\pi\sqrt{2}}{3}$	C. $\frac{32\pi\sqrt{2}}{15}$	D. $\frac{32\pi\sqrt{2}}{3}$	E. NOTA

21. Circle X has a diameter of 20 inches. Chord $\overline{AB}$ is 6 inches from the center X. Find the length of chord $\overline{AB}$.

A. 8 in.	B. 16 in.	C. $2\sqrt{91}$ in.	D. $4\sqrt{91}$ in.	E. NOTA

22. A translation maps the graph of $y = \frac{1}{x}$ to the graph of $y = \frac{3x+7}{x+2}$. What is the equation of the image of the graph of $y = x^2$ under the same translation?

A. $y = x^2 - 2x + 3$	B. $y = x^2 - 2x - 3$	C. $y = x^2 + 4x + 7$	D. $y = x^2 + 4x - 7$	E. NOTA

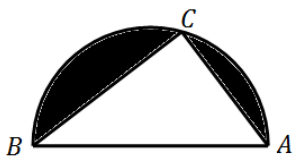
23. Find the coefficient of the degree 8 term of the MacLaurin polynomial associated with the function $f(x) = e^{-2x^2}$.

A. $\frac{2}{3}$	B. $\frac{2}{315}$	C. $\frac{1}{24}$	D. $\frac{1}{40320}$	E. NOTA

24. A circle with radius $\sqrt{3}$ is cut in half, then one of the halves is folded into the shape of a cone. Find the volume of the cone.

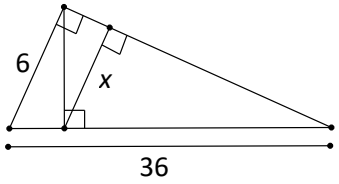
A. $\frac{3}{8}\pi$	B. $\frac{\sqrt{3}}{8}\pi$	C. $\frac{1}{2}\pi$	D. $\frac{\sqrt{3}}{2}\pi$	E. NOTA

25. In the figure, $\overline{AB}$ is the diameter of the semicircle and point C lies on the semicircle. If the area of the shaded region is equal to the area enclosed by $\triangle ABC$, which of the following is the measure of $\angle ABC$?



A. $\tan^{-1}\frac{\pi}{4}$	B. $\frac{1}{2}\tan^{-1}\frac{\pi}{2}$	C. $2\sin^{-1}\frac{2}{\pi}$	D. $\frac{1}{2}\sin^{-1}\frac{\pi}{4}$	E. NOTA

26. Find *x*.



A. $\frac{14}{5}$	B. $\frac{35}{6}$	C. $\sqrt{35}$	D. $\frac{5}{3}$	E. NOTA

27. $\int_{-3}^{2} |x^2 + 4x + 3|\, dx =$

A. $\frac{50}{3}$	B. $\frac{25}{3}$	C. $\frac{54}{3}$	D. $\frac{28}{3}$	E. NOTA

28. If $f(x)=\left(1+\cos\left(\sin^{-1}x\right)\right)\left(1-\cos\left(\sin^{-1}x\right)\right)$, what is the value of $f\left(\frac{\sqrt{3}}{5}\right)$?

A. 0.09	B. 0.12	C. 0.24	D. 0.36	E. NOTA

29. Find the approximate value of the function $y = \sqrt{2\sin(x) + 9}$ at the value $x = -0.09$ using a tangent line to the graph of y at $x = 0$.

A. 2.985	B. 3.015	C. 2.970	D. 2.7182	E. NOTA

30. Find the radius of the incircle of a triangle whose sides measure 20, 99, and 101.

A. 6	B. 18	C. 9	D. 15	E. NOTA