

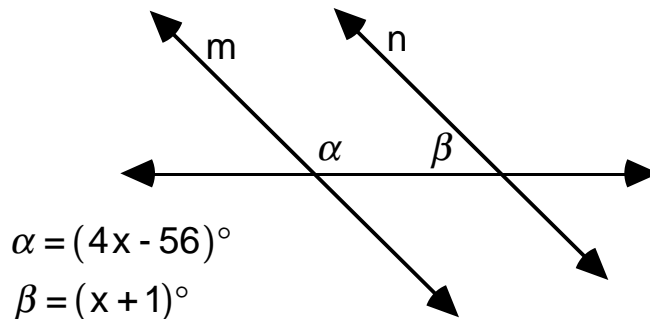
GEORGIA SOUTHERN UNIVERSITY
1995 MATHEMATICS TOURNAMENT
JUNIOR VARSITY WRITTEN EXAM

1. A mechanic is paid time-and-one-half for each hour worked over 40 hours in a week. In a recent week, she worked 47 hours and earned \$454.50. What is her regular hourly salary?
(a) \$9.00
(b) \$9.10
(c) \$9.50
(d) \$9.67
(e) none of the above
2. There is a coordinate system for \overline{PQ} which assigns point P the coordinate 2 and Q the coordinate 7. Name the coordinate of the point K in \overline{PQ} such that $|KQ| = 3$.
(a) 10
(b) 5
(c) 4
(d) -1
(e) 6
3. Factor completely: $x^2y^2 - 16y^2 - 4x^2 + 64$
(a) $(y^2 - 4)(x^2 - 16)$
(b) $(y - 2)^2(x - 4)^2$
(c) $(y + 2)^2(x + 4)^2$
(d) $(y - 2)(y + 2)(x - 4)(x + 4)$
(e) $(y - 2)(y + 2)(x^2 + 16)$
4. Solve: $7^{2(x+1)} = 343$
(a) $\frac{5}{2}$
(b) 2
(c) 1
(d) $\frac{1}{2}$
(e) none of the above

5. Evaluate: $\frac{2 + 4(|6 - 3 \cdot 2| - 3|-2|)}{1 + 2^3 \div 4 \cdot 5}$

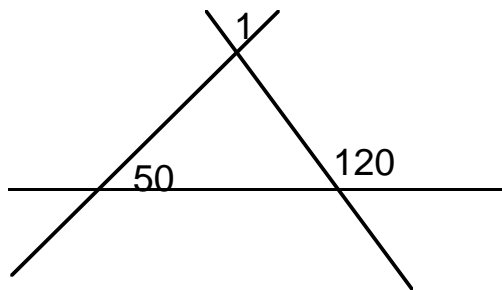
- (a) $\frac{2}{11}$
- (b) $\frac{288}{45}$
- (c) $\frac{520}{9}$
- (d) $\frac{-110}{7}$
- (e) -2

6. If m and n are parallel lines find the value of x .



- (a) 47
 - (b) 19
 - (c) 29
 - (d) 25
 - (e) 7
7. Turtle A and turtle B start at the same time from the same point and travel in opposite directions toward two bits of food. Both turtles reach their food in one hour. Turtle A's speed was 3 kph and turtle B's was 4 kph. If each turtle had gone in the direction the other turtle took, turtle A would have reached the food _____ minutes after turtle B reached its food.
- (a) 33
 - (b) 34
 - (c) 35
 - (d) 36
 - (e) 37

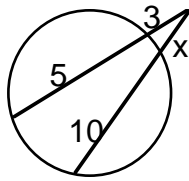
8. If P is on arc AB, $m \text{ arc APB} = 70^\circ$, and $m \text{ arc AP} = 40^\circ$, then $m \text{ arc PB} = \underline{\quad ?}$
- (a) 55°
 (b) 110°
 (c) 30°
 (d) 15°
 (e) 35°
9. Find the center and radius of the circle with equation $x^2 + y^2 + 10x - 2y + 17 = 0$
- (a) center $(-5, 1)$ and $r = 9$
 (b) center $(5, -1)$ and $r = 9$
 (c) center $(-5, 1)$ and $r = 3$
 (d) center $(5, -1)$ and $r = 3$
 (e) center $(-5, -1)$ and $r = 3$
10. Mr. Green receives a 10% raise every year. His salary after 4 such raises has gone up by what percent?
- (a) 40%
 (b) 44%
 (c) 44.61%
 (d) 46.41%
 (e) 47.74%
11. Find the measure of $\angle 1$ in the following figure.



- (a) 40°
 (b) 50°
 (c) 60°
 (d) 70°
 (e) 110°

12. A collection of quarters, dimes, and nickels is worth \$4.55 and has 44 coins in it. If there are 6 more nickels than dimes in the collection, find the number of quarters in the collection.
- (a) 7
 - (b) 8
 - (c) 15
 - (d) 21
 - (e) 24

13. Find x .



- (a) 12
 - (b) 2
 - (c) $\frac{3}{2}$
 - (d) 8
 - (e) 6
14. Simplify: $\frac{i^{13}}{i^{-12}}$
- (a) i
 - (b) $-i$
 - (c) 1
 - (d) -1
 - (e) none of the above
15. Trapezoid ABCD has bases \overline{AB} and \overline{CD} and has median \overline{XY} . If $XY = 15$ and $CD = 10$, find AB .
- (a) 25
 - (b) 12.5
 - (c) 5
 - (d) 2.5
 - (e) 20

16. Given $f(x) = 2x + 1$, find $f^{-1}(x)$.

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

(b) $f^{-1}(x) = \frac{x-1}{2}$

(c) $f^{-1}(x) = 2x + 1$

(d) $f^{-1}(x) = x - \frac{1}{2}$

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

17. The radius of the quadrant and the diameter of the large semicircle are 8. Find the radius of the small semicircle given the semicircles are tangent.

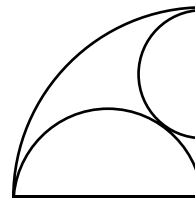
(a) 2

(b) $\frac{8}{3}$

(c) $\frac{16}{3}$

(d) 4

(e) $4\sqrt{2}$



18. How many permutations of MONKEY have M as the first letter?

(a) 16

(b) 21

(c) 120

(d) 720

(e) none of the above

19. Simplify: $\frac{1 - \frac{1}{x}}{\frac{1}{x} - \frac{1}{x^2}}$

(a) $\frac{1}{x}$

(b) x

(c) 1

(d) -1

(e) none of the above

20. The measure of the supplement of an angle is 80° less than the measure of the angle. Find the measure of the angle.

- (a) 100°
- (b) 130°
- (c) 20°
- (d) 50°
- (e) 80°

21. Solve: $\frac{4}{x+3} + \frac{2x}{x^2-9} = \frac{1}{x-3}$

- (a) -3
- (b) $\frac{-9}{5}$
- (c) $\frac{6}{5}$
- (d) 3
- (e) no solution

22. Solve: $\frac{x-4}{-x^2-x+2} \geq 0$

- (a) $(-\infty, -2) \cup (1, 4)$
- (b) $(-\infty, -2) \cap (1, 4]$
- (c) $(-\infty, -2] \cup [1, 4]$
- (d) $(-\infty, -2) \cup (1, 4]$
- (e) $(-\infty, -2] \cap (1, 4)$

23. Find an equation of the line perpendicular to $6x + 2y = 4$ which goes through the point $(0, 2)$.

- (a) $x + 3y = 6$
- (b) $x - 3y = 6$
- (c) $x - 3y = -6$
- (d) $x + 3y = -6$
- (e) $-x + 3y = -6$

24. Given $y = \frac{x^2 + 2}{x + 4}$. If $y = \frac{1}{2}$ what is x ?

(a) $\frac{1}{2}$

(b) $\frac{-1}{2}$

(c) $0, \frac{-1}{2}$

(d) $0, \frac{1}{2}$

(e) no solution

25. The sum of the ages of two children is 14. Two years ago the age of one child exceeded twice the age of the other by one year. How old are the children now?

(a) 3 and 7

(b) 4 and 10

(c) 5 and 9

(d) 2 and 8

(e) 6 and 8

26. The hypotenuse of a right triangle is 10 meters long and the length of one leg exceeds the length of the other leg by one meter. How long is each leg?

(a) $\frac{-1 + \sqrt{199}}{2}$ and $\frac{1 + \sqrt{199}}{2}$

(b) $\frac{-1 + 2\sqrt{199}}{2}$ and $\frac{1 + 2\sqrt{199}}{2}$

(c) $\frac{-1 + i\sqrt{201}}{2}$ and $\frac{1 + i\sqrt{201}}{2}$

(d) $\frac{-1 + i\sqrt{197}}{2}$ and $\frac{1 + i\sqrt{197}}{2}$

(e) $\frac{-1 + 2i\sqrt{197}}{2}$ and $\frac{1 + 2i\sqrt{197}}{2}$

27. Find the point(s) where the line $3x + 2y = 0$ intersects the circle $x^2 + y^2 = 13$?

- (a) $(-2,3)$
- (b) $(-2,3)$ and $(2,-3)$
- (c) $(2,3)$ and $(-2,-3)$
- (d) $(2,3)$
- (e) $(2,3)$ and $(2,-3)$

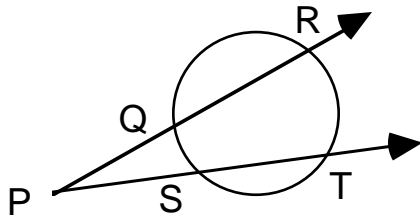
28. Simplify: $(\sqrt{6} + 3\sqrt{8})^2$

- (a) 78
- (b) 30
- (c) $78 + 12\sqrt{3}$
- (d) $78 + 24\sqrt{3}$
- (e) $102\sqrt{3}$

29. Given the parabola $y = 4 - x^2$, find the area of the triangle formed by the two x-intercepts and the vertex.

- (a) 16
- (b) 8
- (c) 4
- (d) 2
- (e) none of the above

30. If $m \angle QS = 22^\circ$ and $m \angle RT = 90^\circ$, find the $m \angle P$.

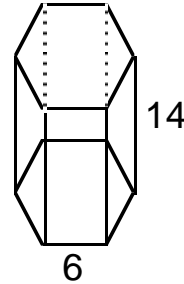


- (a) 56°
- (b) 68°
- (c) 20°
- (d) 34°
- (e) 18°

31. Solve the system:
- $$\begin{aligned}3x - y + 2z &= 13 \\5x - 3y - z &= 3 \\4x + 2y + 5z &= 30\end{aligned}$$
- (a) $(-2, 1, 10)$
(b) $(-2, 3, 11)$
(c) $(2, -1, 3)$
(d) $(2, 3, 5)$
(e) $(2, 1, 4)$
32. Find the quotient and remainder for $(4x^4 - 2x^3 + 6x - 1) \div (x - 1)$.
- (a) $Q(x) = 4x^3 - 6x^2 + 6x, r = -1$
(b) $Q(x) = 4x^3 + 2x^2 + 18x, r = 7$
(c) $Q(x) = 4x^3 - 6x^2 + 12x, r = -13$
(d) $Q(x) = 4x^3 + 2x^2 + 2x + 8, r = 7$
(e) $Q(x) = 4x^3 + 2x + 8, r = 7$
33. A man 6 feet tall has been walking away from a streetlight. When he is 10 feet from the light, he stops. If his shadow is 11 feet long, how high is the streetlight?
- (a) $\frac{126}{11}$ ft
(b) $\frac{22}{7}$ ft
(c) $\frac{231}{6}$ ft
(d) $\frac{60}{11}$ ft
(e) 60 ft
34. Solve: $\log(2x + 50) = 2$
- (a) -24
(b) -20
(c) 25
(d) 75
(e) 475

35. Let $N(t) = 75t^2 - 151t + 6$ represent the number of bacteria in a culture after t hours. In how many hours will there be 62 bacteria in the culture?
- (a) $\frac{3}{7}$ hrs
 (b) $\frac{7}{25}$ hrs
 (c) $\frac{8}{25}$ hrs
 (d) $\frac{8}{3}$ hrs
 (e) $\frac{7}{3}$ hrs

36. Find the volume of the following.



- (a) $756\sqrt{3}$
 (b) 756
 (c) 1512
 (d) $1512\sqrt{3}$
 (e) 378
37. A man is digging a hole and standing in it. He is 5 feet 10 inches tall. When we come upon him he tells us that he is $\frac{1}{4}$ done and that when he is finished, the top of his head will be three times as far below ground as it is now above ground. How deep will the hole be when finished?
- (a) 80 inches
 (b) 97 inches
 (c) 100 inches
 (d) 130 inches
 (e) 160 inches
38. A 30% salt solution weighs 60 kg. After some water is removed by vaporization, the concentration becomes 40%. What is the weight of the solution now?
- (a) 20 kg
 (b) 80 kg
 (c) 45 kg
 (d) 35 kg
 (e) 40 kg

39. Find the equation of the ellipse with vertices $(\pm 5, 0)$ and foci $(\pm 2, 0)$.

(a) $\frac{x^2}{25} + \frac{y^2}{21} = 1$

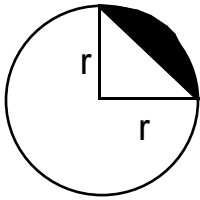
(b) $\frac{x^2}{21} + \frac{y^2}{25} = 1$

(c) $\frac{x^2}{25} - \frac{y^2}{21} = 1$

(d) $\frac{x^2}{21} - \frac{y^2}{25} = 1$

(e) none of the above

40. Given $r = 3$. Find the area of the shaded region.



(a) $\frac{9}{4}\pi$

(b) $\frac{9}{2}$

(c) $\frac{9}{2}(\pi - 1)$

(d) $\frac{9}{4}\pi - 3$

(e) $\frac{9}{4}\pi - \frac{9}{2}$

GSU MATH TOURNAMENT
1995 JUNIOR VARSITY EXAM SOLUTIONS

- | | |
|-------|-------|
| 1. A | 20. B |
| 2. C | 21. E |
| 3. D | 22. D |
| 4. D | 23. C |
| 5. E | 24. D |
| 6. A | 25. C |
| 7. C | 26. A |
| 8. C | 27. B |
| 9. C | 28. D |
| 10. D | 29. B |
| 11. D | 30. D |
| 12. B | 31. E |
| 13. B | 32. D |
| 14. A | 33. A |
| 15. E | 34. C |
| 16. B | 35. E |
| 17. B | 36. A |
| 18. C | 37. E |
| 19. B | 38. C |
| | 39. A |
| | 40. E |