

Benchmark 2 Review

1. Solve: $3x^3 - 6x^2 > 0$

2. Solve: $(x-1)^2 \leq 4$

Given $f(x) = 2x + 5$, $g(x) = x^2 - 10$ and $h(x) = 3x - 8$, find the following.

3. $f(g(x))$

4. $g(h(x))$

Find the inverse. Is it a function?

5. $h(x) = \sqrt{6+5x}$

6. $f(x) = 15 + 8x^3$

State all horizontal and vertical asymptotes of the function.

7. $f(x) = \frac{x-4}{x^2-x-6}$

8. $f(x) = \frac{x^2-9}{x^2+3x-10}$

Solve.

9. $\log_6(y+4) + \log_6(3y) = 2$

10. $\log x + \log(x-3) = 1$

Simplify (assume variable expressions are positive).

11. $(3x^3 - 17x^2 + 13x + 4) \div (3x - 2)$

12. $(2x^4 - 3x^3 - x + 2) \div (2x + 1)$

List all possible rational roots.

13. $x^3 + x^2 - 17x + 15 = 0$

14. $x^3 - 11x^2 + 8x + 20 = 0$

15. One root of $x^3 - 5x^2 - 4x + 20 = 0$ is $x = -2$. Find the other roots.

16. If $x = 6$ is a root of the polynomial equation $x^3 - 7x^2 + 4x + 12 = 0$ what is the sum of the other two roots?

17. Factor $8y^3 - 125$ completely.

18. Factor $x^6 - 27$ completely.

19. Solve: $\frac{2x}{2x+1} + \frac{1}{3x} = 1$

Name _____

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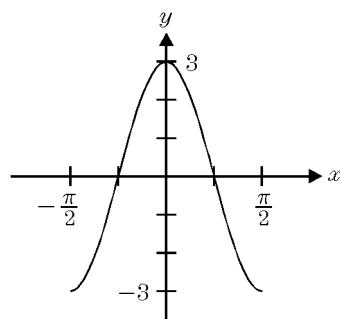
20. Solve: $\frac{2(x-7)}{x^2+3x-28} + \frac{x-2}{x-4} = \frac{x+3}{x+7}$

21. $\sin[\arctan(\frac{4}{3})]$ is equal to

- a) $\frac{3}{4}$ b) $\frac{4}{5}$ c) $\frac{4\sqrt{5}}{5}$ d) $\frac{\sqrt{3}}{4}$ e) $\frac{3}{25}$

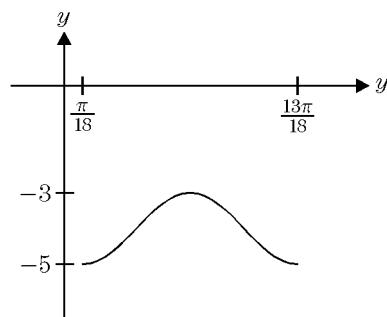
22. Find the exact value of $\sin(\arctan 3)$.

23. This graph illustrates a sine function for one complete cycle. Which of the following is the equation of this graph?



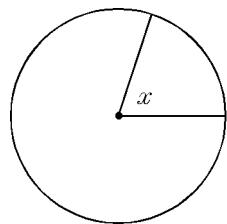
- a) $y = 3 \sin(3x)$ b) $y = 3 \sin(4x + \frac{\pi}{4})$
 c) $y = 3 \sin(\frac{\pi x}{4})$ d) $y = 3 \sin(2x - \frac{\pi}{2})$
 e) $y = 3 \sin(2x + \frac{\pi}{2})$

24. This graph illustrates a cosine function for one complete cycle. Which of the following is the equation of this graph?



- a) $y = \cos(3x + \frac{\pi}{6}) - 5$
 b) $y = -\cos(3x - \frac{\pi}{6}) - 5$
 c) $y = -\cos(3x - \frac{\pi}{6}) - 4$
 d) $y = -\cos(2x - \frac{2\pi}{9}) - 4$
 e) $y = -\cos(2x + \frac{2\pi}{9}) - 4$

25. The area of a sector of a circle of diameter 16 mm is 19.2 mm². Find the central angle in radians (x in the diagram).



26. The area of a sector of a circle of diameter 20 mm is 25 mm². Find the central angle in radians (x in the diagram).

27. For $y = 23 \sin \frac{3}{4}(x + 20) + 18$ state the (1) amplitude, (2) period, (3) vertical shift (positive or negative), and (4) phase displacement.
28. For $y = 17 + 8 \cos 6(2\theta - 32)$ state the (1) amplitude, (2) period, (3) vertical shift (positive or negative), and (4) phase displacement.

29. Simplify: $\frac{2 \cos x}{\sin 2x}$

30. Simplify: $\frac{1 + \cos 2\theta}{2}$

Simplify.

31. $(\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2$

32. $\cos^2 \theta + \sin^2 \theta + \cot^2 \theta$

Verify each identity.

33. $\frac{1}{1 - \sin \theta} - \frac{1}{1 + \sin \theta} = 2 \tan \theta \sec \theta$

34. $\frac{\cos \theta + \sin \theta}{\cos \theta} + \frac{\cos \theta - \sin \theta}{\sin \theta} = \csc \theta \sec \theta$

35. Express $\sin 45^\circ \cos 15^\circ - \cos 45^\circ \sin 15^\circ$ as a trigonometric function of a single angle and simplify.

36. Which of the following is equivalent to $\cos \frac{\pi}{3} \cos \frac{\pi}{4} + \sin \frac{\pi}{3} \sin \frac{\pi}{4}$?

- a) $\cos \frac{\pi}{12}$ b) $\cos \frac{\pi}{6}$ c) $\cos \frac{7\pi}{6}$
 d) $-\sin \frac{7\pi}{6}$ e) $\sin \frac{7\pi}{6}$

37. Given that $\sin \alpha = -\frac{8}{17}$ and $\cos \beta = -\frac{4}{5}$, α and β are in quadrant III, then $\sin(\alpha - \beta) = \underline{\hspace{2cm}}$.

38. If $\csc A = -\frac{5}{3}$ and $\csc B = -\frac{13}{5}$ with $\angle A$ and $\angle B$ are in quadrant III. What is the value of $\cos(A + B)$?

39. If $\csc B = -\frac{13}{5}$ with $\angle B$ is in quadrant III. What is the value of $\cos(2B)$?

40. If $\cos \theta = -\frac{12}{13}$ and θ lies in quadrant II, then what is the value of $\sin 2\theta$?

41. What is the solution set of the equation $2 \cos^2 \theta - \cos \theta = 0$ over the interval $0^\circ \leq \theta < 360^\circ$?

42. Solve the following for x , where $0 \leq x < 2\pi$.
Answer in terms π .

$$\sin x - 2 \sin x \cos x = 0$$

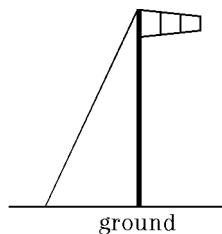
43. Solve the following equation for θ , $0 \leq \theta < 2\pi$.

$$2 \cos^2 \theta + \cos \theta = 1$$

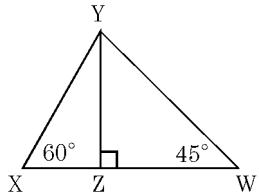
44. Solve $2 \sin^2 \theta - 1 = \sin \theta$ for $0 \leq \theta < 360^\circ$.

45. The Sears Tower in Chicago, Illinois, is 443 m tall. Suppose that at a certain time of day it casts a shadow 750 m long on the ground. What is the angle of elevation of the sun at that time of day? Round your answer to the nearest degree.

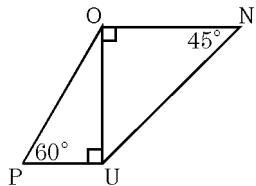
46. In the figure, the height of the flag pole is 10 m. A wire 12 m long runs from the top of the pole and is bolted to the ground. If the wire is tight, what is the measure of the angle, to the nearest degree, between the ground and the wire?



47. If the length of \mathbf{XY} is 6, what is the length of \mathbf{YW} ?



48. In the figure, $\mathbf{PU} = 2$. Find the length of \mathbf{ON} .



49. If the point $P(5, -7)$ is a point on the terminal side of angle θ an angle in standard position. What is the exact value of $\csc \theta$?
50. The point $(-5, 12)$ lies on the terminal arm of an angle θ in standard position. Find $\cos \theta$.

Answer List

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|---|--|--|
| 1. $(2, \infty)$ | 2. $[-1, 3]$ | 3. $2x^2 - 15$ |
| 4. $9x^2 - 48x + 54$ | 5. $\frac{x^2 - 6}{5}$; $(x \geq 0)$; yes | 6. $\sqrt[3]{\frac{x-15}{8}}$; yes |
| 7. $x = -2, x = 3, y = 0$ | 8. $x = 2, x = -5, y = 1$ | 9. $y = 2$ |
| 10. $x = 5$ | 11. $x^2 - 5x + 1, R = 6$ | 12. $x^3 - 2x^2 + x - 1, R = 3$ |
| 13. $\pm 1, \pm 3, \pm 5, \pm 15$ | 14. $\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$ | 15. 2, 5 |
| 16. 1 | 17. $(2y - 5)(4y^2 + 10y + 25)$ | 18. $(x^2 - 3)(x^4 + 3x^2 + 9)$ |
| 19. 1 | 20. 2 | 21. b |
| 22. $\frac{3\sqrt{10}}{10}$ | 23. e | 24. c |
| 25. 0.6 | 26. 0.6 | 27. (1) 23, (2) $\frac{8\pi}{3}$, (3) 18, (4) -20 |
| 28. (1) 8, (2) $\frac{\pi}{6}$, (3) 17, (4) 16 | 29. $\csc x$ | 30. $\cos^2 \theta$ |
| 31. 2 | 32. $\csc^2 \theta$ | 33. |
| 34. | 35. $\frac{1}{2}$ | 36. a |
| 37. $-\frac{13}{85}$ | 38. $\frac{33}{65}$ | 39. $\frac{119}{169}$ |
| 40. $-\frac{120}{169}$ | 41. $\{60^\circ, 90^\circ, 270^\circ, 300^\circ\}$ | 42. 0, π , $\frac{\pi}{3}$, $\frac{5\pi}{3}$ |
| 43. $\frac{\pi}{3}, \frac{5\pi}{3}, \pi$ | 44. $90^\circ, 210^\circ, 330^\circ$ | 45. 31° |
| 46. 56° | 47. $3\sqrt{6}$ | 48. $2\sqrt{3}$ |
| 49. $-\frac{\sqrt{74}}{7}$ | 50. $-\frac{5}{13}$ | |

Catalog List

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|----------------|----------------|----------------|
| 1. APC AA 7 | 2. APC AA 12 | 3. TRI HB 33 |
| 4. TRI HB 34 | 5. TRI HC 46 | 6. TRI HC 52 |
| 7. TRI ID 31 | 8. TRI ID 69 | 9. TRI KF 137 |
| 10. TRI KF 143 | 11. TRI GA 69 | 12. TRI GA 105 |
| 13. TRI GE 15 | 14. TRI GE 16 | 15. CM1 PD 34 |
| 16. CM1 PD 36 | 17. CM1 AB 33 | 18. CM1 AB 38 |
| 19. CM1 CE 31 | 20. CM1 CE 33 | 21. APC AC 27 |
| 22. APC AC 29 | 23. APC AC 69 | 24. APC AC 72 |
| 25. CM1 IA 37 | 26. | 27. CM1 IE 35 |
| 28. CM1 IF 15 | 29. CM1 IJ 18 | 30. CM1 IJ 20 |
| 31. TRI QA 85 | 32. TRI QA 50 | 33. TRI QC 46 |
| 34. TRI QC 93 | 35. CM1 II 29 | 36. CM1 II 38 |
| 37. CM1 II 48 | 38. CM1 II 50 | 39. CM1 IJ 47 |
| 40. CM1 IJ 49 | 41. CM1 IK 21 | 42. CM1 IK 29 |
| 43. CM1 IK 36 | 44. CM1 IK 102 | 45. CM2 JF 44 |
| 46. CM2 JF 47 | 47. CM2 JC 48 | 48. CM2 JC 62 |
| 49. CM1 IB 37 | 50. CM2 JC 116 | |