

Summit Math

Name _____

Advanced Algebra & Trigonometry Placement Test

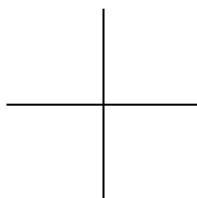
This test is divided into 12 sections to help you assess your readiness for the 12 units in the 6-book Summit Math Advanced Algebra & Trigonometry series (summitmath.com).
Use additional paper as needed, and check your answers using the provided Answer Key.

Only use a calculator when you see this icon: 

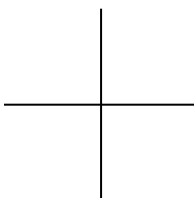
Book 1 | Unit 1: Analyzing Functions & Transformations

1. Sketch a simple graph of each function.

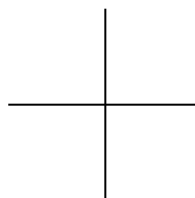
a. $y = \frac{1}{2}x - 2$



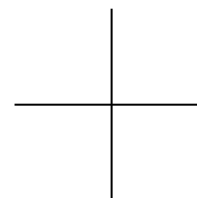
b. $x = 3$



c. $y = x^2$



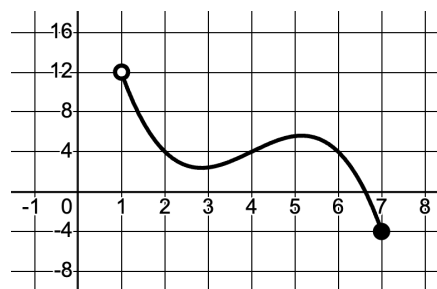
d. $y = -x^2 + 3$



2. Identify the domain and range of the function.

domain:

range:



3. Simplify each expression.

a. $(-1)^2$

b. $(-3x)^2$

c. $(-2)^3$

d. $(-x)^3$

4. If $f(x) = 3 - x$ and $g(x) = -2x^2$, evaluate the following expression.

a. $f(x - 4)$

b. $g(f(x))$

Book 1 | Unit 2: Absolute Value Functions, Equations & Inequalities

5. Simplify each expression below.

a. $|4|$

b. $|-7|$

c. $|2 - 6|$

6. Consider the equations shown below. List all x-values that make this equation true.

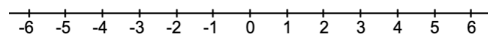
a. $|x| = 3$

b. $|x| = 0$

c. $|x| = -3$

7. On the number line below, show all x-values that make this inequality true.

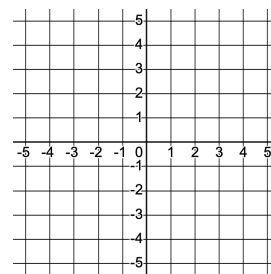
$|x| \leq 3$



8. Graph the 2 lines on the same graph.

a. $y - 1 = -\frac{3}{2}(x + 2)$

b. $-3x - 2y = 4$



Book 2 | Unit 3: Quadratic Functions, Equations & Inequalities

9. Solve each equation.

a. $x^2 = 36$

b. $2x^2 = 8x$

c. $(x - 5)^2 = 9$

d. $x^2 - 11x + 24 = 0$

e. $5x^2 - 2x - 7 = 0$

f. $x^3 - 3x^2 - 4x + 12 = 0$

10. Simplify each expression.

a. $\sqrt{2}\sqrt{10}$

b. $\sqrt{18} + \sqrt{2}$

c. $x^3 \cdot x^2$

d. $x^3 + x^3$

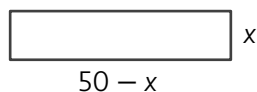
11. Simplify each expression by making its exponent positive and/or rationalizing its denominator.

a. 2^{-1}

b. $\frac{6}{\sqrt{3}}$

c. $(\sqrt{2})^{-1}$

12. What is the area and perimeter of the rectangle?

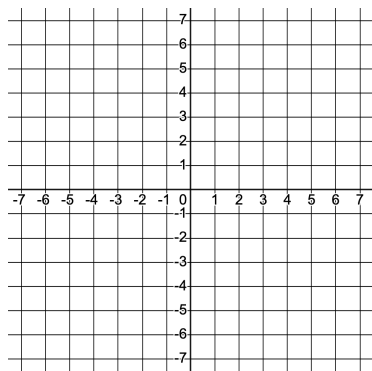


Book 2 | Unit 4: Circles & Nonlinear Systems

13. Identify the solution of each system by graphing it.

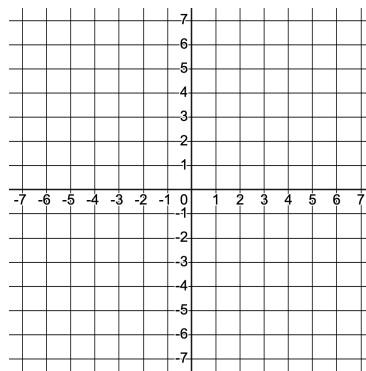
a.

$$\begin{cases} 2x + 4y = -12 \\ 4y = 3x + 8 \end{cases}$$



b.

$$\begin{cases} y > x + 2 \\ 2x - 2y \geq 6 \end{cases}$$



14. What is the distance between the points $(-2, 3)$ and $(1, -1)$? What is their midpoint?

Book 3 | Unit 5: Polynomial Functions & Roots

15. Find the value of a if $x = -2$ and $y = 2$.

$$y = a(x - 1)^3 - 7$$

16. If $f(x) = x^3 - 4$, write the equation for $g(x)$ if it is defined in terms of $f(x)$ as shown.

a. $g(x) = 3f(x)$

b. $g(x) = -f(x) + 2$

17. Identify the x -intercept of each function.

a. $2x + 4y = -12$

b. $y = x^2 + 3x - 4$

18. Simplify each expression.

a. $(3x^2 + 2x) - (2x^2 - 5x)$

b. $(3x^2 + 2)(2x - 5)$

c. $(6x^6) \div (2x^2)$

19. Expand each binomial, by raising it to the exponent shown.

a. $(3x - 4)^2$

b. $(x - y)^3$

Book 3 | Unit 6: Inverse, Square Root & Cube Root Functions

20. Isolate x in each function.

a. $y = \frac{x}{2} - 3$

b. $y = (x + 2)^3 - 4$

21. For the pair of functions shown, evaluate $f(g(x))$.

$$f(x) = 3x + 1$$

$$g(x) = \frac{x-1}{3}$$

Book 4 | Unit 7: Exponential Equations & Functions

22. Simplify each expression, using only positive exponents.

a. $(x^3)^{-2}$

b. $(x^6)^{1/2}$

c. $27\left(\frac{3}{5}\right)^{-2}$

23. Simplify each expression, using only positive exponents in your final result.

a. $(2^5)^{x+2}$

b. $\frac{x^4}{x^{-3}}$

c. $2 \cdot 2^{2x}$

d. $\frac{100}{x^3} \cdot x^{-2}$

24. Solve the equation.

$$\frac{x+2}{x-2} = \frac{-3}{x}$$

25. In the expression $500(1.2)$, multiplying 500 by 1.2 increases 500 by _____ %.26. In the expression $30(0.9)$, multiplying 30 by 0.9 decreases 30 by _____ %.

27. Solve the equation. Round to the nearest thousandth.

$$10 = 2(x - 3)^7$$

28. A rare trading card is worth \$200. The value of the card increases by 10% every year for 3 years. Find the value of the card at the end of each of those 3 years.

Book 4 | Unit 8: Logarithmic Properties, Equations & Functions

Book 4 | Unit 7 is the prerequisite for this Unit.

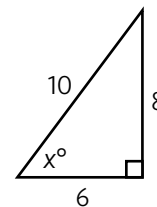
Book 5 | Unit 9: Radians, Degrees & Unit Circle Trigonometry

29. Use the labeled triangle to identify each ratio.

a. $\sin(x^\circ)$

b. $\cos(x^\circ)$

c. $\tan(x^\circ)$



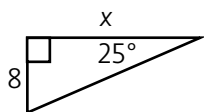
30.  Solve each equation. Put the calculator in Degree Mode. Round to the hundredth.

a. $\tan(50^\circ) = \frac{x}{5}$

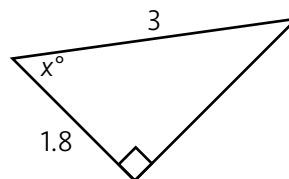
b. $\sin(5^\circ) = \frac{10}{y}$

31.  Determine the value of x , rounded to the tenth. Put the calculator in Degree Mode.

a.



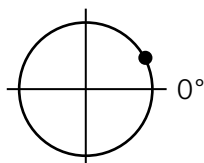
b.



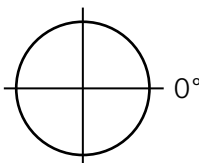
32. What is the circumference of a circle with a radius of 3 inches? What is its area?

33. Use a point to estimate the location of each angle on the circle. The first is done for you.

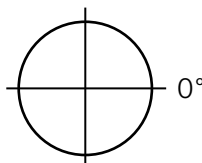
a. 30°



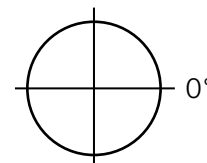
b. 45°



c. 90°

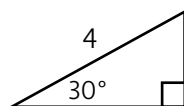


d. 225°

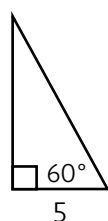


34. Find the lengths of the unmarked sides of each triangle. Write each length as a fraction.

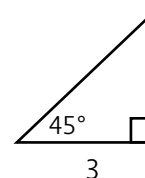
a.



b.

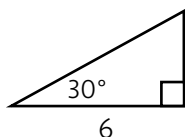


c.

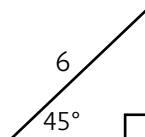


35. Find the lengths of the unmarked sides of each triangle.

a.



b.



36. What is the reciprocal of each value shown?

a. $\frac{1}{2}$

b. $-\frac{3}{4}$

c. -1

d. $\frac{1}{0}$

e. 0

Book 5 | Unit 10: Trigonometric Equations & Identities

37. Solve for x in each of the following equations.

a. $3x = \frac{\pi}{4} + 2\pi n$

b. $\frac{x}{2} = \frac{\pi}{4} + \pi n$

38. Simplify each expression shown.

a. $\frac{x + 4x^2}{x}$

b. $\frac{\frac{x}{y}}{\frac{y}{x}}$

c. $\frac{x}{4} + \frac{x+2}{3}$

d. $\frac{x}{x+2} - \frac{x+2}{x+1}$

Book 6 | Unit 11: Graphing Trigonometric Functions

39. What is the average of each pair of numbers?

a. 3 and 12

b. $-\frac{1}{4}$ and $\frac{7}{8}$

c. $-\frac{\pi}{3}$ and $\frac{3\pi}{4}$

40. Solve the equation.

$$\frac{2\pi}{x} = \frac{3\pi}{4}$$

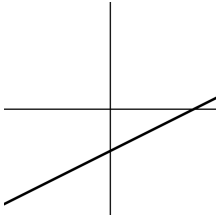
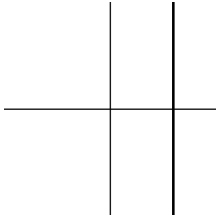
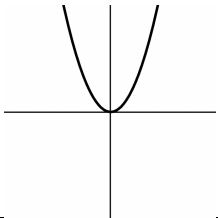
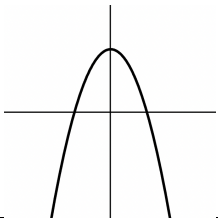
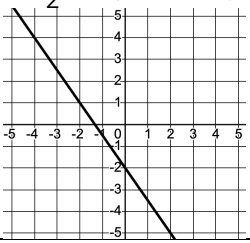
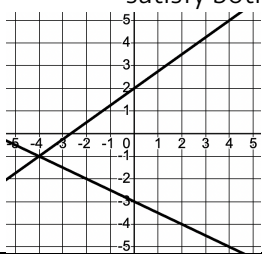
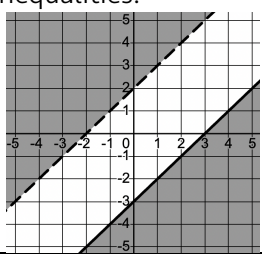
Book 6 | Unit 12: Permutations, Combinations & Probability

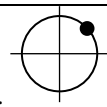
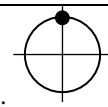
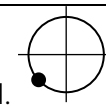
41. How many ways can you arrange the letters A, B and C? Write all possible arrangements below.

42. If you roll a 6-sided number cube, what is the probability it lands on a 1 or a 2?

43. Simplify this expression. $4(-2x)^3 \left(\frac{1}{2}y\right)^2$

Answer Key

1.	a.  b.  c.  d. 
2.	a. $1 < x \leq 7$ b. $-4 \leq x < 12$
3.	a. 1 b. $9x^2$ c. -8 d. $-x^3$
4.	a. $3 - (x - 4) \rightarrow 3 - x + 4 \rightarrow 7 - x$ b. $-2(3 - x)^2 \rightarrow -2(9 - 6x + x^2) \rightarrow -18 + 12x - 2x^2$
5.	a. 4 b. 7 c. $ -4 \rightarrow 4$
6.	a. $x = \pm 3$ b. $x = 0$ c. no solution
7.	
8.	Both equations form the same line, with a slope of $-\frac{3}{2}$ and y-intercept of -2. 
9.	a. $x = \pm 6$ b. $x = 0$ or 4 c. $x = 2$ or 8 d. $x = 3$ or 8 e. $x = -1$ or $\frac{7}{5}$ f. $x = \pm 2$ or 3
10.	a. $2\sqrt{5}$ b. $4\sqrt{2}$ c. x^5 d. $2x^3$
11.	a. $\frac{1}{2}$ b. $2\sqrt{3}$ c. $\frac{\sqrt{2}}{2}$
12.	area: $50x - x^2$ perimeter: 100
13.	a. solution: $(-4, -1)$ b. no solution $\rightarrow$ That are no points that satisfy both inequalities.  

14.	distance: 5 units midpoint: $(-0.5, 1.5)$
15.	$a = -\frac{1}{3}$
16.	a. $g(x) = 3x^3 - 12$ b. $g(x) = -x^3 + 6$
17.	a. $(-6, 0)$ b. $(1, 0)$ and $(-4, 0)$
18.	a. $x^2 + 7x$ b. $3x^3 - 15x^2 + 4x - 10$ c. $3x^4$
19.	a. $9x^2 - 24x + 16$ b. $x^3 - 3x^2y + 3xy^2 - y^3$
20.	a. $2y + 6 = x$ b. $\sqrt[3]{y+4} - 2 = x$
21.	$f(g(x)) = x$
22.	a. $\frac{1}{x^6}$ b. x^3 c. 75
23.	a. 2^{5x+10} b. x^7 c. 2^{2x+1} d. $\frac{100}{x^5}$
24.	$x = -6$ or 1
25.	20%
26.	10%
27.	4.258
28.	year 1: \$220 year 2: \$242 year 3: \$266.20
29.	a. $\frac{4}{5}$ b. $\frac{3}{5}$ c. $\frac{4}{3}$
30.	a. 5.96 b. 114.74
31.	a. 17.2 b. 114.74
32.	Circumference: 6π inches Area: 9π in. ²
33.	   b. c. d.
34.	a. shorter leg: 2 longer leg: $2\sqrt{3}$ b. longer leg: $5\sqrt{3}$ hypotenuse: 10 c. leg: 3 hypotenuse: $3\sqrt{2}$
35.	a. shorter leg: $2\sqrt{3}$ hypotenuse: $4\sqrt{3}$ b. both legs are $3\sqrt{2}$
36.	a. 2 b. $-\frac{4}{3}$ c. -1 d. 0 e. undefined
37.	a. $x = \frac{\pi}{12} + \frac{2\pi}{3}n$ b. $x = \frac{\pi}{2} + 2\pi n$
38.	a. $1 + 4x$ b. $\frac{x^2}{y}$ c. $\frac{7x+8}{12}$ d. $\frac{-3x-4}{x^2+3x+2}$
39.	a. 7.5 b. $\frac{5}{16}$ c. $\frac{5\pi}{24}$
40.	$x = \frac{8}{3}$
41.	6 ways: ABC, ACB, BAC, BCA, CAB, CBA
42.	$\frac{1}{3}$
43.	$-8x^3x^2$