

# Precalculus Honors Summer Assignment 2015

Instructions: Complete all **ODD** numbered problems on a separate sheet of paper. Show all work.

Email Mr. Healy at [dhealy@lvhs.org](mailto:dhealy@lvhs.org) with any questions.

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Name \_\_\_\_\_

## Rational Exponents and Radical Functions

Find the indicated real  $n$ th root(s) of  $a$ .

1.  $n = 4, a = 81$

2.  $n = 3, a = 512$

3.  $n = 5, a = -243$

Evaluate the expression without using a calculator.

4.  $36^{-1/2}$

5.  $64^{5/6}$

6.  $(\sqrt[3]{216})^{-2}$

7.  $(\sqrt[5]{-32})^4$

Solve the equation. Round the result to two decimal places when appropriate.

8.  $x^3 = -8$

9.  $x^4 + 9 = 90$

10.  $(x - 3)^5 = 60$

11.  $-4x^6 = -400$

Simplify the expression.

12.  $4^{5/2} \cdot 4^{-1/2}$

13.  $\frac{17^{3/7}}{17^{4/7}}$

14.  $(\sqrt[4]{5} \cdot \sqrt{5})^4$

15.  $\frac{\sqrt[3]{135}}{\sqrt[3]{5}}$

16.  $5\sqrt[5]{7} - 7\sqrt[5]{7}$

17.  $\sqrt[3]{2} + 2\sqrt[3]{128}$

18.  $\frac{324^{1/4}}{4^{-1/4}}$

19.  $4\sqrt[3]{108} + 2\sqrt[3]{4}$

Write the expression in simplest form. Assume all variables are positive.

20.  $\sqrt{20x^6y^7}$

21.  $\sqrt[3]{18x^3y^{14}z^{20}}$

22.  $\sqrt[4]{\frac{x^5}{y^{16}}}$

23.  $\sqrt[3]{16x^7y^2} \cdot \sqrt[3]{6xy^5}$

Let  $f(x) = -x + 4$ ,  $g(x) = x^3$ , and  $h(x) = \frac{x}{4}$ . Perform the indicated operation and state the domain.

24.  $f(x) + g(x)$

25.  $g(x) - f(x)$

26.  $g(x) \cdot h(x)$

27.  $\frac{f(x)}{g(x)}$

28.  $f(g(x))$

29.  $g(h(x))$

30.  $h(f(x))$

31.  $f(f(x))$

Verify that  $f$  and  $g$  are inverse functions.

32.  $f(x) = 2x - 4, g(x) = \frac{1}{2}x + 2$

33.  $f(x) = 3x^2 + 1, x \geq 0; g(x) = \left(\frac{x-1}{3}\right)^{1/2}$

Find the inverse of the function.

34.  $f(x) = 5x - 3$

35.  $f(x) = \frac{4}{3}x + 2$

36.  $f(x) = \frac{1}{2}x^2, x \geq 0$

37.  $f(x) = -x^6 + 2, x \leq 0$

38.  $f(x) = \frac{4x^4 - 1}{18}, x \geq 0$

39.  $f(x) = 32x^5 + 4$

Graph the function. Then state the domain and range.

40.  $y = -\frac{1}{3}\sqrt{x}$

41.  $y = \frac{2}{5}\sqrt[3]{x}$

42.  $y = \frac{5}{6}\sqrt{x}$

43.  $y = \sqrt{x+2} - 3$

44.  $y = -2\sqrt[3]{x-1} + 2$

45.  $f(x) = 3\sqrt[3]{x}$

46.  $g(x) = -\frac{1}{2}\sqrt{x-2}$

47.  $h(x) = -\sqrt{x+3} + 4$

Solve the equation. Check your solution.

48.  $\sqrt{2x+3} = 7$

49.  $-5\sqrt{x+1} + 12 = 2$

50.  $\sqrt[3]{5x-1} + 6 = 10$

51.  $2\sqrt[3]{8x+9} = 5$

52.  $7x^{4/3} = 175$

53.  $(x-2)^{3/4} = 1$

54.  $x-8 = \sqrt{18x}$

55.  $x = \sqrt{4x-3}$

56.  $\sqrt{2x+1} + 5 = \sqrt{x+12} - 8$

## Exponential and Logarithmic Functions

Graph the function. State the domain and range.

1.  $y = \left(\frac{4}{3}\right)^x$

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

3.  $y = 3^{x-3} - 2$

4.  $y = \frac{1}{4} \cdot 3^x$

Graph the function. State the domain and range.

5.  $y = \left(\frac{3}{5}\right)^x$

6.  $y = -2\left(\frac{1}{4}\right)^x$

7.  $y = (0.8)^{x-3} - 2$

8.  $y = 2\left(\frac{2}{3}\right)^x + 1$

Simplify the expression.

9.  $e^{-3} \cdot e^{-8}$

10.  $(2e^3)^{-5}$

11.  $\sqrt{81e^{8x}}$

12.  $\frac{28e^{3x}}{21e^{-x}}$

Graph the function. State the domain and range.

13.  $y = 0.5e^{0.8x}$

14.  $y = 2e^{-0.5x} - 2$

15.  $y = 1.5e^{x+1} + 3$

16.  $y = e^{3(x-2)}$

Evaluate the logarithm without using a calculator.

17.  $\log_4 \frac{1}{16}$

18.  $\log_6 6$

19.  $\log_5 125$

20.  $\log_{3/4} \frac{64}{27}$

Simplify the expression.

21.  $5^{\log_3 x}$

22.  $10^{\log 9}$

23.  $\log_3 16^x$

24.  $e^{\ln 5}$

Graph the function. State the domain and range.

25.  $y = \log_7 x$

26.  $y = \log_{1/2} (x-4)$

27.  $y = \log_5 x + 3$

28.  $y = \log_3 (x-2)$

Expand the expression.

29.  $\log_5 \frac{2x}{5}$

30.  $\log \frac{100x^2}{y}$

31.  $\ln 20x^3y^2$

32.  $\log_2 \sqrt[3]{8x^3}$

Condense the expression.

33.  $\log_4 20 + 4 \log_4 x$

34.  $\log 7 + 2 \log x - 5 \log y$

35.  $0.5 \ln 100 - 2 \ln x + 8$

Use the change-of-base formula to evaluate the logarithm.

36.  $\log_2 5$

37.  $\log_4 80$

38.  $\log_5 100$

39.  $\log_7 27$

Solve the equation. Check for extraneous solutions.

40.  $2^{4x+2} = 8^{x+2}$

41.  $\left(\frac{1}{9}\right)^{x-3} = 3^{8x+1}$

42.  $7^{9x} = 18$

43.  $\ln(3x+7) = \ln(x-1)$

44.  $\log_5(3x+2) = 3$

45.  $\log_6(x+9) + \log_6 x = 2$

Write an exponential function  $y = ab^x$  whose graph passes through the given points.

46. (1, 8), (2, 32)

47. (1, 3), (3, 12)

48. (2, -9), (5, -243)

49. (1, 4), (2, 4)

Write a power function  $y = ax^b$  whose graph passes through the given points.

50. (2, 2), (5, 16)

51. (3, 27), (6, 432)

52. (1, 4), (8, 17)

53. (5, 36), (10, 220)

## Rational Functions

The variables  $x$  and  $y$  vary inversely. Use the given values to write an equation relating  $x$  and  $y$ . Then find  $y$  when  $x = -5$ .

1.  $x = 2, y = -10$

2.  $x = \frac{1}{3}, y = 24$

3.  $x = -3, y = -5$

4.  $x = 25, y = -\frac{2}{5}$

Determine whether  $x$  and  $y$  show *direct variation*, *inverse variation*, or *neither*.

<b>5.</b>	<b>X</b>	<b>Y</b>
2.5	32	
4	20	
5	16	
6.4	12.5	
8	10	

<b>6.</b>	<b>X</b>	<b>Y</b>
1	2.5	
3.5	8.75	
5	12.5	
8	20	
9	22.5	

<b>7.</b>	<b>X</b>	<b>Y</b>
11	30	
14	61	
16	85	
24	92	
27	105	

<b>8.</b>	<b>X</b>	<b>Y</b>
-1	12	
3	4	
8	1.5	
12	1	
15	0.8	

Graph the function. State the domain and range.

9.  $y = \frac{6}{x}$

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

11.  $y = \frac{5}{x+1} - 2$

12.  $y = \frac{4x+19}{x+3}$

Graph the function.

13.  $y = \frac{x}{x^2 - 4}$

14.  $y = \frac{x^2 + 1}{x^2 + 4x + 3}$

15.  $y = \frac{x^2 + 2x - 3}{x + 2}$

16.  $f(x) = \frac{2x^2 - 8}{x^2 - 2x}$

Simplify the rational expression, if possible.

17.  $\frac{x^2 + x - 6}{x^2 + 9x + 18}$

18.  $\frac{x^3 + 100x}{x^4 + 20x^3 + 100x^2}$

19.  $\frac{x^2 - 5x - 64}{2x^2 - 98}$

20.  $\frac{x^2 + 7x + 10}{x^2 - 7x - 10}$

Multiply or divide the expressions. Simplify the result.

21.  $\frac{6x^2y}{xy^3} \cdot \frac{2y}{9x^3}$

22.  $\frac{2x^2 - x - 6}{2x^2 + 5x + 3} \cdot \frac{x^2 + x}{x^2 - 4}$

23.  $\frac{3x^2 + 15x}{x^2 - 12x + 36} \cdot (x^2 - x - 30)$

24.  $\frac{12x^6y}{5y^5} \div \frac{3y^2}{x^2}$

25.  $\frac{6x^2 + x - 1}{4x^3 + 4x^2} \div \frac{6x^2 - 2x}{x^2 - 4x - 5}$

26.  $\frac{x^2 - 4x - 32}{2x^2 - 13x - 24} \div \frac{x}{4x^2 - 9}$

Add or subtract the expressions. Simplify the result.

27.  $\frac{x^2}{x+1} - \frac{1}{x+1}$

28.  $\frac{x+5}{x+6} + \frac{1}{x+2}$

29.  $\frac{5}{x+2} + \frac{35}{x^2 - 3x - 10}$

Simplify the complex fraction.

30.  $\frac{\frac{x}{2x+1}}{5 + \frac{3}{x}}$

31.  $\frac{\frac{x+2}{3}}{\frac{1}{x} + 3}$

32.  $\frac{\frac{3}{x^2 - 4}}{\frac{3}{x+2} - \frac{x+1}{x^2 - x - 6}}$

Solve the equation. Check for extraneous solutions.

33.  $\frac{7}{3x+7} = \frac{14}{x+1}$

34.  $\frac{1}{3} + \frac{2}{3} = -\frac{3}{x^2}$

35.  $2 + \frac{4}{x+2} = \frac{2}{x}$

36.  $\frac{4}{x+2} + \frac{6x^2}{x^2 - 4} = \frac{3x}{x+2}$

## Trigonometric Ratios and Functions

Let  $\theta$  be an acute angle of a right triangle. Find the values of the other five trigonometric functions of  $\theta$ .

1.  $\sin \theta = \frac{3}{5}$

2.  $\tan \theta = \frac{8}{15}$

3.  $\sec \theta = 2$

4.  $\cos \theta = \frac{\sqrt{7}}{4}$

Solve  $\triangle ABC$  using the diagram and the given measurements.

5.  $A = 21^\circ, c = 8$

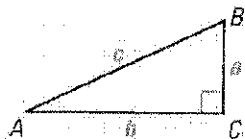
6.  $B = 66^\circ, a = 14$

7.  $B = 60^\circ, c = 20$

8.  $A = 29^\circ, b = 6$

9.  $A = 18^\circ, c = 18$

10.  $B = 56^\circ, c = 7$



Convert the degree measure to radians or the radian measure to degrees.

11.  $100^\circ$

12.  $-6^\circ$

13.  $\frac{3\pi}{4}$

14.  $-\frac{\pi}{6}$

Find the arc length and area of a sector with the given radius  $r$  and central angle  $\theta$ .

15.  $r = 5$  ft,  $\theta = 90^\circ$

16.  $r = 2$  in.,  $\theta = 300^\circ$

17.  $r = 12$  cm,  $\theta = \pi$

Sketch the angle. Then find its reference angle.

18.  $250^\circ$

19.  $-30^\circ$

20.  $\frac{8\pi}{3}$

21.  $-\frac{11\pi}{6}$

Evaluate the function without using a calculator.

22.  $\sin(-60^\circ)$

23.  $\csc 240^\circ$

24.  $\tan \frac{7\pi}{4}$

25.  $\cos\left(-\frac{5\pi}{4}\right)$

Evaluate the expression without using a calculator. Give your answer in both radians and degrees.

26.  $\sin^{-1} 0$

27.  $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

28.  $\cos^{-1} 3$

29.  $\tan^{-1} 1$

Solve the equation for  $\theta$ .

30.  $\sin \theta = 0.25; 90^\circ < \theta < 180^\circ$     31.  $\cos \theta = 0.9; 270^\circ < \theta < 360^\circ$     32.  $\tan \theta = 2; 180^\circ < \theta < 270^\circ$

Solve  $\triangle ABC$ . (Hint: Some of the "triangles" may have no solution and some may have two solutions.)

33.  $A = 34^\circ, a = 6, b = 7$

34.  $A = 50^\circ, C = 65^\circ, b = 60$

35.  $B = 86^\circ, b = 13, c = 11$

Find the area of  $\triangle ABC$  with the given side lengths and included angle.

36.  $A = 35^\circ, b = 50, c = 120$

37.  $B = 35^\circ, a = 7, c = 12$

38.  $C = 20^\circ, a = 10, b = 16$

Solve  $\triangle ABC$ .

39.  $a = 16, b = 23, c = 17$

40.  $C = 50^\circ, a = 12, b = 14$

41.  $A = 80^\circ, b = 7, c = 5$

Find the area of  $\triangle ABC$  with the given side lengths.

42.  $a = 6, b = 3, c = 4$

43.  $a = 14, b = 30, c = 27$

44.  $a = 16, b = 16, c = 20$