



## Section I: Algebra Review

Identify the following statements as true or false.

1.  $\frac{x+y}{2} = \frac{x}{2} + \frac{y}{2}$  \_\_\_\_\_

2.  $\frac{1}{p+q} = \frac{1}{p} + \frac{1}{q}$  \_\_\_\_\_

3.  $\frac{2k}{2x+h} = \frac{k}{x+h}$  \_\_\_\_\_

4.  $3 \cdot \frac{a}{b} = \frac{3a}{b}$  \_\_\_\_\_

5.  $3 \cdot \frac{a+b}{c} = \frac{3a+b}{c}$  \_\_\_\_\_

6.  $\sqrt{a^2 + b^2} = a + b$  \_\_\_\_\_

Identify the following statements as true or false over the set of real numbers. Give a counter example for any false statement.

7.  $x^3 + 1 > x^3$  \_\_\_\_\_

8.  $x^3 + x > x^3$  \_\_\_\_\_

9.  $x^2 \geq 0$  \_\_\_\_\_

10.  $x^2 \geq x$  \_\_\_\_\_

11.  $2x \geq x$  \_\_\_\_\_

12.  $\sqrt{x} \geq 0$  \_\_\_\_\_

13.  $-x \leq 0$  \_\_\_\_\_

14.  $\frac{1}{x} \leq x$  \_\_\_\_\_

15.  $x \leq |x|$  \_\_\_\_\_

16. Solve  $xy' + y + 1 = y'$  for  $y'$ .

17. Solve  $\ln y = kt$  for  $y$ .

16. \_\_\_\_\_

18. Factor:  $y^3 + 27$

19. Factor:  $x^2(x-1) - 4(x-1)$

17. \_\_\_\_\_

18. \_\_\_\_\_

19. \_\_\_\_\_

Simplify each expression.

20.  $\frac{(x^2)^3 x}{x^7}$  \_\_\_\_\_

21.  $\sqrt{x} \cdot \sqrt[3]{x} \cdot x^{\frac{1}{6}}$  \_\_\_\_\_

22.  $\frac{5(x+h)^3 - 5x^3}{h}$  \_\_\_\_\_

23.  $\frac{3(x+h)^2 - 3x^2}{h}$  \_\_\_\_\_

$$24. \frac{\frac{x^2 - 1}{x}}{\frac{x+1}{x^3}} \underline{\hspace{2cm}}$$

$$25. \frac{\frac{1}{x} + \frac{4}{x^2}}{3 - \frac{1}{x}} \underline{\hspace{2cm}}$$

$$26. \frac{\frac{a}{2x+h} - \frac{a}{2x}}{h} \underline{\hspace{2cm}}$$

$$27. \frac{1}{1-2a} - \frac{2}{1+2a} + \frac{6a+2}{4a^2-1} \underline{\hspace{2cm}}$$

*Simplify, using factoring of binomial expressions. Leave answers in factored form.*

**Example:**

$$\begin{aligned} \frac{(x+1)^3(4x-9) - (16x+9)(x+1)^2}{(x-6)(x+1)} &= \frac{(x+1)^2[(x+1)(4x-9) - (16x+9)]}{(x-6)(x+1)} \\ &= \frac{(x+1)^2(4x^2 - 5x - 9 - 16x - 9)}{(x-6)(x+1)} \\ &= \frac{(x+1)^2(4x^2 - 21x - 18)}{(x-6)(x+1)} \\ &= \frac{(x+1)^2(4x+3)(x-6)}{(x-6)(x+1)} \\ &= (x+1)(4x+3) \end{aligned}$$

$$28. (x-1)^3(2x-3) - (2x+12)(x-1)^2 \underline{\hspace{2cm}}$$

$$29. \frac{(x-1)^2(3x-1) - 2(x-1) \cdot 3}{(x-1)^4} \underline{\hspace{2cm}}$$

$$30. \frac{(x-1)^3(2x-3) - (4x-1)(x-1)^2}{(x-1)^2(2x-1)} \underline{\hspace{2cm}}$$

Simplify by rationalizing the numerator.

Example:

$$\frac{\sqrt{x+4}-2}{x} = \frac{\sqrt{x+4}-2}{x} \cdot \frac{\sqrt{x+4}+2}{\sqrt{x+4}+2} = \frac{x+4-4}{x(\sqrt{x+4}+2)} = \frac{x}{x(\sqrt{x+4}+2)} = \frac{1}{\sqrt{x+4}+2}$$

31.  $\frac{\sqrt{x+9}-3}{x}$  \_\_\_\_\_

32.  $\frac{\sqrt{x+h}-\sqrt{x}}{h}$  \_\_\_\_\_

Solve each equation or inequality for  $x$  over the set of real numbers.

33.  $2x^4 + 3x^3 - 2x^2 = 0$  \_\_\_\_\_

34.  $\frac{2x-7}{x+1} = \frac{2x}{x+4}$  \_\_\_\_\_

35.  $\frac{3x+5}{(x-1)(x^4+7)} = 0$  \_\_\_\_\_

36.  $\sqrt{x^2-9} = x-1$  \_\_\_\_\_

37.  $|2x-3| = 14$  \_\_\_\_\_

38.  $x^2 - 2x - 8 < 0$  \_\_\_\_\_

Solve each of the systems.

39.  $x + y = 8$  \_\_\_\_\_  
 $2x - y = 7$

40.  $y = x^2 - 3x$  \_\_\_\_\_  
 $y = 2x - 6$

## Section II: Pre-Calculus Review

Use your knowledge of the unit circle to evaluate each of the following. Leave your answers in radical form.

41.  $\sin(30^\circ)$  \_\_\_\_\_

42.  $\cos \frac{2\pi}{3}$  \_\_\_\_\_

43.  $\tan 45^\circ$  \_\_\_\_\_

44.  $\sin\left(-\frac{\pi}{6}\right)$  \_\_\_\_\_

45.  $\tan \pi$  \_\_\_\_\_

46.  $\csc \frac{5\pi}{6}$  \_\_\_\_\_

47.  $\cos(90^\circ)$  \_\_\_\_\_

48.  $\cos \frac{3\pi}{4}$  \_\_\_\_\_

49.  $\tan \frac{\pi}{6}$  \_\_\_\_\_

50.  $\cos^{-1}\left(\frac{1}{2}\right)$  \_\_\_\_\_

51.  $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right)$  \_\_\_\_\_

52.  $\tan^{-1}(1)$  \_\_\_\_\_

Solve each trigonometric equation for  $0 \leq x \leq 2\pi$ .

53.  $\sin x = \frac{\sqrt{3}}{2}$  \_\_\_\_\_

54.  $\tan^2 x = 1$  \_\_\_\_\_

55.  $\cos \frac{x}{2} = \frac{\sqrt{2}}{2}$  \_\_\_\_\_

56.  $2\sin^2 x + \sin x - 1 = 0$  \_\_\_\_\_

For each trigonometric function identify the amplitude and any horizontal or vertical shifts from the basic function.

57.  $y = \frac{1}{2}\cos \frac{x}{2} - 3$  amplitude: \_\_\_\_\_ period: \_\_\_\_\_ vertical shift: \_\_\_\_\_

58.  $y = 2\sin(2x - \pi)$  amplitude: \_\_\_\_\_ period: \_\_\_\_\_ horizontal shift: \_\_\_\_\_

59.  $y = \tan 3x$  period: \_\_\_\_\_

Solve each exponential or logarithmic equation.

60.  $5^x = 125$  \_\_\_\_\_

61.  $8^{x+1} = 16^x$  \_\_\_\_\_

62.  $81^{\frac{3}{4}} = x$  \_\_\_\_\_

63.  $8^{\frac{-2}{3}} = x$  \_\_\_\_\_

64.  $\log_2 32 = x$  \_\_\_\_\_

65.  $\log_x \frac{1}{9} = -2$  \_\_\_\_\_

66.  $\log_4 x = 3$  \_\_\_\_\_

67.  $\log_3(x + 7) = \log_3(2x - 1)$  \_\_\_\_\_

Expand each of the following using the laws of logs.

68.  $\log_3 5x^2$  \_\_\_\_\_

69.  $\ln \frac{5x}{y^2}$  \_\_\_\_\_

Complete each of the following using trigonometric identities and formulas.

70.  $\sin\left(\frac{\pi}{2} - x\right) =$  \_\_\_\_\_

71.  $\sin^2 x + \cos^2 x =$  \_\_\_\_\_

72.  $\sin 2u =$  \_\_\_\_\_

73.  $\tan x =$  \_\_\_\_\_

74.  $1 + \cot^2 x =$  \_\_\_\_\_

75.  $1 - \cos^2 x =$  \_\_\_\_\_

76. A right triangle has a base of 5 and a hypotenuse of 7. Find the height.

### Section III: Graphing Review

Sketch the following functions. State the domain and range of each. Draw and label your own axes.

77.  $f(x) = x$

78.  $f(x) = x^2$

79.  $f(x) = x^3$

80.  $f(x) = |x|$

81.  $f(x) = [x]$  (Greatest integer function)

82.  $f(x) = \frac{1}{x}$

83.  $f(x) = \sqrt{x}$

84.  $f(x) = e^x$

85.  $f(x) = \ln x$

86.  $f(x) = \sqrt{9 - x^2}$

87.  $f(x) = \sin x$

88.  $f(x) = \cos x$

89.  $f(x) = \tan x$

90.  $f(x) = \csc x$

91.  $f(x) = \sec x$

92.  $f(x) = \cot x$

## Section IV: Intro to Calculus Review - Limits and Derivatives

Evaluate each limit.

$$93. \lim_{x \rightarrow 0} 3 \cos 2x + 2 \text{ _____}$$

$$94. \lim_{x \rightarrow 3} \frac{x^2 - 4x + 3}{x - 3} \text{ _____}$$

$$95. \lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4} \text{ _____}$$

Use the limit definition of derivative to find the derivative of:

$$96. 4x^2 + 3x - 5$$

Use the derivative rules to find the derivative of each function.

$$97. f(x) = 3x^2 - 5x + 11 \text{ _____}$$

$$98. f(x) = 5x^3(x^4 - 3x^2) \text{ _____}$$

Find the antiderivative of each function.

$$99. f(x) = x^4 - 5x^3 + 2x - 6 \text{ _____}$$

$$100. f(x) = \frac{x^2 - x}{x} \text{ _____}$$