

AP Calc AB

Section 1: Algebra Review

Show all work without the use of a calculator.

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

For questions 7-15, identify the statement 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 .

18. Factor: $y^3 + 27$

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

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

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

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

$$26. \frac{1}{1-2a} - \frac{2}{1+2a} + \frac{6a+2}{4a^2-1} \quad \underline{\hspace{2cm}}$$

$$27. \frac{\frac{a}{2x+h} - \frac{a}{2x}}{h} \quad \underline{\hspace{2cm}}$$

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

Example:

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

$$28. \frac{(x-1)^3(2x-3) - (2x+12)(x-1)^2}{(x-1)^4} \quad \underline{\hspace{2cm}}$$

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

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

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. $\frac{3x+5}{(x-1)(x^2+7)} = 0$ _____

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 2: Precalculus 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 3: 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. $f(x) = |x|$

$$81. f(x) = \frac{1}{x}$$

$$82. f(x) = \sqrt{x}$$

$$83. f(x) = e^x$$

$$84. f(x) = \ln x$$

$$85. f(x) = \sqrt{9-x^2}$$

$$86. f(x) = \sin x$$

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

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

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

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

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

AP Calculus AB – Summer Math Packet Answers

1. True
2. False
3. False
4. True
5. False
6. False
7. True $\forall \{x \mid x \in (-\infty, \infty)\}$
8. True $\forall \{x \mid x \in (0, \infty)\}$
9. True $\forall \{x \mid x \in (-\infty, \infty)\}$
10. True $\forall \{x \mid x \in (-\infty, 0) \cup (1, \infty)\}$
11. True $\forall \{x \mid x \in [0, \infty)\}$
12. True $\forall \{x \mid x \in [0, \infty)\}$
13. True $\forall \{x \mid x \in [0, \infty)\}$
14. True $\forall \{x \mid x \in [-1, 0) \cup [1, \infty)\}$
15. True $\forall \{x \mid x \in (-\infty, \infty)\}$
16. $y' = \frac{-(y+1)}{x-1}$
17. $y = e^{kt}$
18. $(y+3)(y^2 - 3y + 9)$
19. $(x-1)(x-2)(x+2)$
20. 1
21. x
22. $15x^2 + 15xh + 5h^2$
23. $6x + 3h$
24. $x^2(x-1)$
25. $\frac{(x+4)}{x(3x-1)}$
26. $\frac{3}{4a^2 - 1}$
27. $\frac{-a}{2x(2x+h)}$
28. $(x-1)^2(x+1)(2x-9)$
29. $\frac{3x^2 - 4x - 5}{(x-1)^3}$
30. $x - 4$
31. $\frac{1}{\sqrt{x+9} + 3}$
32. $\frac{1}{\sqrt{x+h} + \sqrt{x}}$
33. $x = 0, \frac{1}{2}, -2$
34. $x = -28$
35. $x = \frac{-5}{3}$
36. $x = 5$
37. $x = \frac{17}{2}, \frac{-11}{2}$
38. $\{x \mid x \in (-2, 4)\}$
39. $(5, 3)$
40. $(3, 0) (2, -2)$
41. $\frac{1}{2}$
42. $\frac{-1}{2}$
43. 1
44. $\frac{-1}{2}$
45. 0
46. 2
47. 0
48. $\frac{-\sqrt{2}}{2}$
49. $\frac{\sqrt{3}}{3}$
50. 60° or $\frac{\pi}{3}$
51. 45° or $\frac{\pi}{4}$
52. 45° or $\frac{\pi}{4}$
53. $\frac{\pi}{3}, \frac{2\pi}{3}$
54. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
55. $\frac{\pi}{2}$

56. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

57. $\frac{1}{2}, 4\pi, \text{down } 3$

58. $2, \pi, \text{Right } \frac{\pi}{2}$

59. $\frac{\pi}{3}$

60. 3

61. 3

62. 27

63. $\frac{1}{4}$

64. 5

65. 3

66. 64

67. $x = 8$

68. $\log_3(5) + 2\log_3(x)$

69. $\ln(5) + \ln(x) - 2\ln(y)$

70. $\cos(x)$

71. 1

72. $2\sin(u)\cos(u)$

73. $\frac{\sin(x)}{\cos(x)}$

74. $\csc^2(x)$

75. $\sin^2(x)$

76. $4\sqrt{6}$

