

AP Calculus AB Summer Homework

This will be due on FIRST day of class.

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1 Functions

1.1 Quadratic Functions

Complete the square to find the transformation for each quadratic function and find the x -intercepts:

1. $y = 2x^2 + 3x + 1$
2. $y = -x^2 + 4x - 3$
3. $y = -2x^2 + 5x - 2$
4. $y = \frac{1}{2}x^2 - 3x - \frac{7}{2}$

1.2 Rational Functions

Find the vertical and horizontal asymptote as well as holes for each function when applicable:

- | | |
|----------------------------------|-----------------------------------|
| 5. $f(x) = \frac{1}{x^2}$ | 8. $f(x) = \frac{4-x}{x^2-16}$ |
| 6. $f(x) = \frac{x^2}{x^2-4}$ | 9. $f(x) = \frac{x-1}{x^2+x-2}$ |
| 7. $f(x) = \frac{2+x}{x^2(1-x)}$ | 10. $f(x) = \frac{5x+20}{x^2-16}$ |

1.3 Exponential/Logarithmic Functions

Find the value of x for each function:

Prove the following statements:

- | | |
|--|--|
| 11. $3^{3x+5} = 9^{2x+1}$ | 14. $\log_{\sqrt{b}} x = 2 \log_b x$ |
| 12. $\left(\frac{1}{9}\right)^x = 27^{2x+4}$ | 15. $\log_{\frac{1}{\sqrt{b}}} \sqrt{x} = -\log_b x$ |
| 13. $\left(\frac{1}{6}\right)^x = 216$ | 16. $\log_{b^4} x^2 = \log_b \sqrt{x}$ |

1.4 Transformation

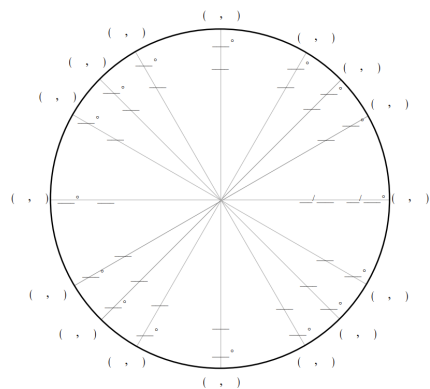
Write the resultant function based on the description provided:

17. $y = -2x^2 + 4x - 4$ that has a horizontal shift of -3 units and a vertical shift of $+1$.
18. A sine function that has a vertical shift of $+4$ and a period of $\frac{3\pi}{2}$.
19. A logarithmic function that has been reflected along the x -axis, vertically compressed by $\frac{1}{2}$, and horizontally shifted $+3$ units.
20. An rational function that has a vertical asymptote at $x = -4$ and has been vertically shifted $-\frac{1}{3}$ units.

2 Trigonometry

2.1 Unit Circle

Fill out the unit circle below:



Find the corresponding ordered pair on the unit circle:

21. $t = \frac{\pi}{2}$

26. $t = \frac{5\pi}{3}$

22. $t = \frac{\pi}{4}$

27. $t = \frac{\pi}{3}$

23. $t = \frac{5\pi}{6}$

28. $t = -\frac{4\pi}{3}$

24. $t = \frac{4\pi}{3}$

29. $t = -\frac{3\pi}{4}$

25. $t = \frac{3\pi}{4}$

30. $t = -\frac{5\pi}{6}$

Complete the following table:

<i>Function</i>	<i>$\theta(deg)$</i>	<i>$\theta(rad)$</i>	<i>Function Value</i>
sin	30		
cos	45		
sec		$\frac{\pi}{4}$	
tan		$\frac{\pi}{3}$	
cot			$\frac{\sqrt{3}}{3}$
csc			$\sqrt{2}$
csc		$\frac{\pi}{6}$	
sin		$\frac{\pi}{4}$	
cot			1
tan			$\frac{\sqrt{3}}{3}$

2.2 Graphs

Graph each trig function (include two full periods):

31. $f(x) = -\cos \frac{2x}{3}$

34. $f(x) = \frac{1}{5} \csc(6x)$

32. $f(x) = \frac{5}{3} \tan \frac{4x}{5}$

35. $f(x) = \frac{2}{3} \tan \left(\frac{\pi}{10} x \right)$

33. $f(x) = \frac{1}{4} \sin(2\pi x)$

36. $f(x) = \frac{5}{2} \sec \frac{x}{4}$

2.3 Identities

Verify the following using trig identities:

37. $(\sec x - \tan x)^2 = \frac{1 - \sin x}{1 + \sin x}$

38. $\cos(x + y) + \cos(x - y) = 2 \cos x \cos y$

39. $1 + 2 \sin 2\theta = (\sin \theta + \cos \theta)^2$

40. $2 \sin x \sin y = \sin(x + y) - \sin(x - y)$

3 Algebra

3.1 Factoring

Factor the following expressions completely:

41. $x^3 + 6x^2 + 12x + 8$

42. $x^6 - y^6$

43. $x^3 + 5x^2 - 4x - 20$

3.2 Distribution

Distribute the following expressions completely:

44. $(x + 1)(x^2 - x + 1)$

45. $(a - 2b)(a^2 + 2ab + 4b^2)$

46. $\left(a + \frac{1}{3}\right)^3$

47. $(2x - 3y)^3$

48. $(x + y)^3(x - y)^3$

4 Parent Functions

Sketch and determine the domain, range, and x/y -intercepts for each function. State the vertical/horizontal asymptotes and symmetry if applicable:

49. $f(x) = x$

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

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

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

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

54. $f(x) = \frac{1}{x^2}$

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

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

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

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

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

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

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

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

5 Fundamentals

Simplify each expression completely:

$$63. \frac{8xy^3}{6x^2y}$$

$$64. \frac{x^2 - 1}{x^2 + x - 2}$$

$$65. \frac{3x + 6}{x^2 + x + 1} \times \frac{x^3 - 1}{2x^2 + 3x - 2}$$

$$66. \frac{2x^2 + 3x - 9}{x^2 + x} \div \frac{2x^2 + x - 6}{x^3 - x}$$

$$67. \frac{x^2 - 6}{x + 3} + \frac{x}{x + 3}$$

$$68. \frac{1}{2x - 1} - \frac{2}{4x^2 - 1}$$

$$69. \frac{\frac{x}{2} - 1}{1 - \frac{2}{x}}$$

$$70. \frac{1 + \frac{2}{x+1}}{1 + \frac{4}{x-1}}$$

$$71. \frac{1}{1 - \frac{1}{1 - \frac{1}{1+x}}}$$

$$72. \frac{1}{1 - \frac{1}{1 + \frac{1}{1-x}}}$$

Perform long division on the following rational functions:

$$73. \frac{x^4 + x^3 - 4x^2 + 2}{x^2 + x - 1}$$

$$74. \frac{x^3 - 2x^2 + 3x + 5}{x + 2}$$

$$75. \frac{-x^4 + 2x^2 + 8}{x^2 + x - 3}$$