

## AP Calculus – Summer Assignment

Below is your summer assignment for AP Calculus. It is 55 problems from Honors Math 3 and Honors Pre-Calculus. These are all problems and skills that you need to be able to do before you start Calculus. All the problems must be done **without using a calculator**. A large part of Calculus is solving problems without using a calculator. The summer assignment will count as 2 grades. The first grade will be an informal grade that will be the grade you receive on your summer assignment. The second grade will be quiz (formal grade) taken within the first two weeks of class covering these topics.

This assignment should take you a few hours to complete. Do not put it off until the last minute. Many problems are very straight forward and easy to solve, but some may take a little longer and may require you to do some research online to help you remember how to solve them.

Format:

- All work should be on lined notebook paper.
- Write the original problem and all work shown for full credit. No work = no credit.
- Label each section and problem.
- Highlight your final answers.
- All problems should be completed without a calculator.
- Put name on all sheets and staple together in order.
- **Due the first day of class.**

### Section 1: Domain and Range

Find the domain of the following functions. All answers should be written in interval notation.

$$1. y = \frac{\sqrt{2x+14}}{x^2-49}$$

$$2. y = \sqrt{2x-9}$$

$$3. y = \log(x-10)$$

Find the range of the following functions. All answers should be written in interval notation.

$$4. y = 100^x$$

$$5. y = \sqrt{x^2+1} + 1$$

### Section 2: Special Factorization

Completely factor the following expressions.

$$6. x^3 - 25x$$

$$7. 3x^8 - 3$$

$$8. 16x^4 - 24x^2y + 9y^2$$

$$9. 144 + 32x^2 - x^4$$

$$10. x^3 - xy^2 + x^2y - y^3$$

### Section 3: Solving Quadratic Equations

Solve the following equations. If the equation will not factor, use the quadratic formula.

$$11. x^2 + x + \frac{1}{4} = 0$$

$$12. 2x^2 - 72 = 0$$

$$13. 7x^2 - 7x + 2 = 0$$

$$14. x^3 - 5x^2 + 5x - 25 = 0$$

$$15. x + \frac{1}{x} = \frac{17}{4}$$

### Section 4: Asymptotes

Find any vertical and horizontal asymptotes. Also, if the graph has any holes, identify the location of the holes.

$$16. y = \frac{2x^2+6x}{x^2+5x+6}$$

$$17. y = \frac{x}{x^2-25}$$

$$18. y = \frac{x^3+4x}{x^3-2x^2+4x-8}$$

$$19. y = \frac{x^3}{x^2+4}$$

$$20. y = \frac{1}{x} - \frac{x}{x+2} \text{ (hint: rewrite with a common denominator)}$$

### Section 5: Negative and Fractional Exponents

Simplify the following expressions. Be sure to your final answers only contains positive exponents.

$$21. -12^2x^{-5}$$

$$22. (4x^{-1})^{-1}$$

$$23. \frac{(x^2-1)^{-\frac{1}{2}}}{(x^2+1)^{\frac{1}{2}}}$$

$$24. \frac{1}{4}(16x^2)^{-\frac{3}{4}}(32x)$$

$$25. (x^{-1} + y^{-1})^{-1}$$

### Section 6: Eliminating Complex Fractions

Complex fractions are fractions within fractions. Answers are never left with complex fractions and they must be simplified.

$$26. \frac{4-\frac{2}{9}}{3+\frac{4}{3}}$$

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

$$28. \frac{1+x^{-1}}{1-x^{-2}}$$

$$29. \frac{x^{-1}+y^{-1}}{x+y}$$

$$30. \frac{2x(2x-1)^{\frac{1}{2}}-2x^2(2x-1)^{-\frac{1}{2}}}{(2x-1)}$$

### Section 7: Rational Expressions – adding, subtracting, and solving

Add or subtract the following rational expressions.

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

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

$$33. \frac{x^2-2x+3}{x^2+7x+12} - \frac{x^2-4x-5}{x^2+7x+12}$$

Solve the following rational equations.

$$34. \frac{5}{2x} - \frac{5}{3(x+5)} = \frac{5}{x}$$

$$35. \frac{2x-1}{x-1} - \frac{3x}{2x+1} = \frac{x^2+11}{2x^2-x-1}$$

## Section 8: Solving Inequalities

Solve the following inequalities. For the inequalities involving rational functions, be sure to include your number line where you tested each interval. All final answers should be written in interval notation.

$$36. \frac{2x-7}{x-5} \leq 1$$

$$37. 4 - \frac{5x}{3} > -(2x + \frac{1}{2})$$

$$38. x^2 - 3x > 18$$

$$39. -7 \leq 6x - 1 < 11$$

$$40. x^3 < 4x^2$$

## Section 9: Exponential Functions and Logarithms

Solve the following equations. Since you are not using a calculator, your answers may still contain logs or  $e$ .

$$41. \log_9(x^2 - x + 3) = \frac{1}{2}$$

$$42. \ln x^3 - \ln x^2 = \frac{1}{2}$$

$$43. e^{3x} + 5 = 6$$

Evaluate the following. Your answer will be a number.

$$44. \ln \frac{1}{\sqrt[3]{e^2}}$$

$$45. \log_{12} 2 + \log_{12} 9 + \log_{12} 8$$

## Section 10: Solving Trig Equations

Solve the following trig equations on the interval  $[0, 2\pi)$

$$46. \sin^2 x = \sin x$$

$$47. 3\tan^3 x = \tan x$$

$$48. 2\cos^2 x + \sin x - 1 = 0$$

$$49. x \cos x = 3 \cos x$$

$$50. 3 \cos x = 2 \sin^2 x$$

## Section 11: Unit Circle values

Without having a Unit Circle in front of you, give the simplified, exact, rationalized answer (if it exists) for each of the following. Write "DNE" if it does not exist.

$$51. \sin \frac{7\pi}{4}$$

$$52. \cot \frac{5\pi}{3}$$

$$53. \cos \frac{11\pi}{6}$$

$$54. \cos \frac{2\pi}{3}$$

$$55. \sec \frac{5\pi}{6}$$