

AP Precalculus – Summer Assignment

Complete all the problems on the following pages.

AP Precalculus requires a strong foundation in algebraic manipulation, linear and quadratic functions and inequalities, polynomials and factoring methods, properties of exponents and radicals, and graphical analysis. It also assumes a general familiarity with rational expressions and functions, exponential and logarithmic functions, and trigonometric functions. You should have a general idea of what each of these parent functions look like and the properties and terminology associated with them (extrema, end behavior, etc.) This is likely your first college-level mathematics course, so it is important to be proficient in these prerequisites. The course contains more content and moves at a faster pace than previous math courses. There is not much time – if any – for review from (Honors) Algebra II, so make sure you are comfortable with the problems here!

You may work together on these, but understand that working together is **NOT** dividing up the work and sharing answers – this behavior will set you behind before the class even starts, and it is also considered to be academic misconduct. Part of learning the material requires genuine practice and struggle, so give yourself the time to properly complete the questions. Avoid using your calculator on this unless the question tells you to use it – the AP exam has sections that require a calculator and sections that do not allow a calculator, so we should get used to not using it. **You must show your work to receive credit!**

This packet will be due in the first week of class. **Do not wait until the last minute to do this!** Please email me at chris.kunz@longbeachsaints.org if you have any questions!

1. Solve the following linear equations, and simplify your solution:

(a) $-(x + 2) + 5x = 5(-3x - 6) + 5x$

(b) $7(-x + 2) - 6x = 5(-x - 1) - 3x$

2. Solve the following linear inequalities, simplify your solution, and graph it on a number line:

(a) $-7x - 5(5x - 4) > -5x - 8 + x$

(b) $|x + 2| - 1 > 4$

3. Solve each system of equations by your choice of substitution or elimination:

(a)
$$\begin{cases} 6x - 5y = -28 \\ 7x + y = 22 \end{cases}$$

(b)
$$\begin{cases} 5x + 3y = -7 \\ 2x + 7y = 3 \end{cases}$$

(c) $\begin{cases} 7x - 6y = -53 \\ 2x - 3y = -13 \end{cases}$

(d) $\begin{cases} 4x + y + z = -10 \\ 5x - 3y - z = -7 \\ 6x + y - z = 8 \end{cases}$

4. Factor each expression completely, if possible:

(a) $x^2 - 3x - 4$

(b) $x^2 + 4x - 21$

(c) $x^2 - 10x + 25$

(d) $x^2 - 49$

(e) $3x^2 + 12x - 36$

(f) $3x^2 - 8x + 24$

(g) $5x^2 + 14x + 9$

(h) $4x^2 + 31x + 21$

5. Solve each quadratic equation by factoring:

(a) $3x^2 + 16x + 9 = 4$

(b) $5x^2 + 13x + 21 = 3x^2$

6. Solve each quadratic equation using the quadratic formula. Simplify all radicals, complex numbers, and/or fractions in your solutions:

(a) $x^2 - 3x - 3 = x$

(b) $3x^2 + 12x + 7 = -x^2$

7. Factor the polynomials below completely! Check for GCF, quadratic types, difference of squares/cubes, sum of cubes, grouping, etc.:

(a) $2x^2 + 12x + 16$

(b) $x^2 - 3x + 10$

(c) $x^4 + 2x^2 - 24$

(d) $8x^3 + 27$

(e) $2x^3 - 18x$

(f) $x^3 - 4x^2 + 2x - 8$

(g) $5x^3 - x^2 - 5x + 1$

(h) $5x^2 - 3x - 2$

(i) $3x^2 + 7x + 2$

8. Solve each of the polynomial equations by factoring, or by the quadratic formula if factoring is not possible. The equation **MUST** be set equal to 0 before factoring or applying the quadratic formula! Simplify any radicals, complex numbers, and/or fractions.

(a) $12x^2 + 8x = 0$

(b) $x^4 + 5x^2 = -4$

(c) $x^3 - 3x^2 - 8x + 24 = 0$

(d) $x^2 - 4x - 9 = 0$

(e) $2x^2 + 3x = 5$

(f) $2x^3 - 3x^2 = 32x - 48$

9. Divide the polynomials using synthetic division:

(a) $(y^3 + 5y^2 - 7y + 2) \div (y - 2)$

(b) $(k^3 - 17k + 32) \div (k + 5)$

10. Divide the polynomials using long division.

(a) $(x^4 - 5x^3 + x^2 + 20x - 10) \div (x^2 - x - 5)$

(b) $(4x^3 + 6x^2 + 2) \div (2x + 1)$

11. Assuming x, y are both positive, write the following expressions in simplest radical form:

(a) $xy\sqrt{27x^5y^6}$

(b) $2y^3\sqrt{50x^7y^5}$

(c) $xy^2\sqrt[3]{8x^{10}y^7}$

12. Rewrite the following expressions using a single fractional exponent:

(a) $\sqrt[3]{3} \cdot \sqrt[5]{3^2}$

(b) $\sqrt[5]{7} \cdot \sqrt[4]{7^3}$

13. Express the following fractions in simplest form using only positive exponents.

(a) $\frac{3(s^3)^4}{12s^8}$

(b) $\frac{4b^{-8}}{(-3b^5)^5}$

(c) $\frac{4st^9}{(2s^{-3}t^4)^{-3}}$

14. Simplify the following expressions. Write each complex number in $a + bi$ form:

(a) $(11 + 2i) + (7 - 5i)$

(b) $(-5 - 8i) - (7 - 4i)$

(c) $(5 - 2i)(9 + 10i)$

(d) $(-7 + 2i)^2$

(e) $\frac{6-4i}{2i}$

(f) $\frac{1-i}{1+2i}$

15. Let $f(x) = 2x + 3$ and $g(x) = 3x^2 + 2$

(a) Find and simplify $(fg)(x)$.

(b) Find and simplify $(f \circ g)(x)$.

16. Let $f(x) = x^2 - 4x + 1$ and $g(x) = 5x - 2$.

(a) Find and simplify $(f \circ g)(1)$.

(b) Find and simplify $(g \circ f)(x)$.

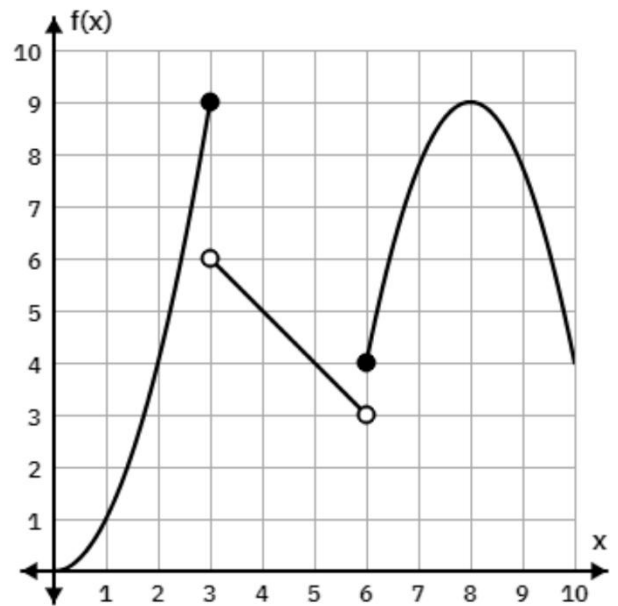
17. Refer to the graph of a piecewise function $f(x)$ on the right in the questions below:

(a) Find $f(2)$, $f(6)$, and $f(8)$.

(b) Solve for x if $f(x) = 1$.

(c) Solve for x if $f(x) = 4$.

(d) Solve for x if $f(x) = 9$.



18. Find each product or quotient by writing the result as a single, simplified fraction. Check for common factors that cancel before and after multiplying/dividing!

(a) $\frac{4x^2-4x}{2x^2+4x-6} \cdot \frac{x^2+x-6}{4x^2+8x}$

(b) $\frac{10v-5v^2}{v^2-11v+18} \cdot \frac{v^2-8v-9}{15v}$

(c) $\frac{2n-3}{n+1} \div \frac{9-4n^2}{2n^2+5n+3}$

(d) $\frac{v^2-49}{20v^3} \div \frac{v^2+v-42}{4v^2-24v}$

19. Find each sum or difference by writing the result as a single, simplified fraction. Check for factorizations in the denominator before adding/subtracting, and check for factors that cancel after adding/subtracting!

(a) $\frac{x^2-5}{x^2+5x+6} + \frac{1}{x+2}$

(b) $\frac{5}{w+1} + \frac{8}{w-7}$

(c) $\frac{2}{4p-20} - \frac{p-6}{p^2-8p+15}$

(d) $\frac{b}{b+3} - \frac{4}{b}$

20. Simplify each compound fraction by writing the result as a single, simplified fraction.

(a) $\frac{4 - \frac{1}{x}}{\frac{8}{x} - \frac{2}{x^2}}$

(b) $\frac{x + \frac{1}{x}}{\frac{(x^2 + 1)^2}{4x}}$

21. Expand the logarithmic expressions. If possible, simplify any numerical logarithms without a calculator:

(a) $\log_2(8x^2y^3)$

(b) $\log\left(\frac{100\sqrt{x}}{y^3}\right)$

22. Condense the logarithmic expressions.

(a) $\log_3(x) - 4\log_3(y) + 2\log_3(z)$

(b) $2\log_2(6) + \frac{2}{3}\log_2(x) - \log_2(18^3\sqrt{x} \cdot z)$

23. Solve each equation by exponentiating both sides:

(a) $\log_6(2x - 4) = -2$

(b) $3\log_2(x + 4) - 5 = 10$

(c) $2\ln(x) + 3 = 4$

(d) $3\ln(3x - 2) = 3$

24. If $0 < \theta < \frac{\pi}{2}$, find the value of each specified trigonometric function (Hint: Draw a right triangle, use Pythagorean theorem, and apply SOHCAHTOA!). Simplify any radicals.

(a) If $\sin(\theta) = \frac{3}{5}$, find $\tan(\theta)$.

(b) If $\cos(\theta) = \frac{1}{3}$, find $\csc(\theta)$.

25. Solve the trigonometric equation for all values of θ in $0 \leq \theta \leq 2\pi$ (Hint: You are solving for the angle that outputs the cosine or sine value. Isolate the trig expression first. Use the unit circle, remember that $\cos(\theta)$ is the x -coordinate and $\sin(\theta)$ is the y -coordinate, and if there is a common factor, factor!). You may write your answer in degrees or radians (just know that degrees are not used in this class).

(a) $6 \sin(\theta) - 3 = 0$

(b) $5 \cos(\theta) + 1 = 3 \cos(\theta)$

(c) $4 \cos(\theta) = 2 \cos(\theta) - 2$

(d) $\sin^2(\theta) - \sin(\theta) = 0$

(e) $\cos(\theta) \sin(\theta) + \cos(\theta) = 0$

(f) $2 \cos(\theta) \sin^2(\theta) - \sqrt{2} \cos(\theta) \sin(\theta) = 0$