

Welcome to AP Precalculus!

Successful AP Precalculus students must have a strong foundation in algebra and trigonometry. The following packet was designed to help you review your algebra skills in preparation for AP Precalculus. Please do these problems thoughtfully (on separate paper) and check your answers (they are at the end of this document). If you find you need more practice on particular topics, find extra practice online. The stronger your algebra skills are when you enter AP Precalculus, the better off you will be throughout the year.

Topics to have Mastered

[Factoring with \$a > 1\$](#)

[Sum and Difference of Cubes](#)

[Solving Quadratics with Complex Conjugates](#)

[Linear, Perpendicular, and Parallel Systems](#)

(Put into Point-Slope as well)

[Odd and Even Functions](#)

[Exact Values of Special Angled Trig Functions](#)

[Arithmetic and Geometric Sequences](#)

Topics to Review (We will go deeper)

[Review on Khan Academy](#)

Polynomial Functions:

Pascal's Triangle

Dividing Polynomials (Synthetic and Long)

Transformations and End Behavior

Composition of Functions

Foundational Trigonometry

Section 1: Algebra Review

1. Solve for y: $xy - 3x - 2 = 3y$

2. Factor completely: $8x^3 + 27$

3. Factor completely: $3x^{\frac{3}{2}} - 9x^{\frac{1}{2}} + 6x^{-\frac{1}{2}}$

4. Simplify $\frac{5(x+h)^2 - 5x^2}{h}$

5. Factor completely: $x^2(x-3) - 4(x-3)$

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

7. $\frac{3x+2}{(x+3)(x^2-4)} = 0$

Simplify the following. Leave answers in fraction form.

Example:

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

$$8. (x-1)^3(2x-3) - (2x+12)(x-1)^2$$

$$9. \frac{(x-1)^2(3x-1) - 2(x-1)}{(x-1)^4}$$

10. Simplify by rationalizing the numerator:

Example:

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

$$11. \frac{3 - \sqrt{x+9}}{x}$$

$$12. \frac{\sqrt{x+h} - \sqrt{x}}{h}$$

Solve each over the real numbers. Write your answer in interval notation.

$$13. |x-3| \leq 2$$

$$14. |2x+1| > 4$$

$$15. x^2 - 3x - 10 < 0$$

Section 2 : Trig review

In Calculus, trigonometry shows up randomly so there are things you need to remember. You need to know the 3 Pythagorean Identities and You MUST know your special values.

16. List the Pythagorean identities : 1. 2. 3.

17. Leave all answers in radical form:

$$a. \cos\left(\frac{3\pi}{4}\right)$$

$$b. \sin\left(\frac{7\pi}{6}\right)$$

$$c. \sec\left(\frac{\pi}{6}\right)$$

$$d. \sin\left(\frac{\pi}{2}\right)$$

$$e. \cos(\pi)$$

$$f. \cot\left(\frac{7\pi}{4}\right)$$

$$g. \cos\left(\frac{5\pi}{3}\right)$$

$$h. \sin\left(\frac{\pi}{3}\right)$$

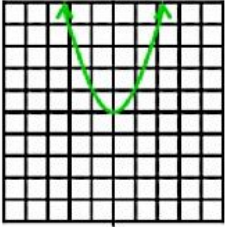
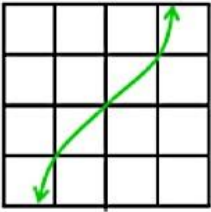
$$i. \cos\left(\frac{5\pi}{6}\right)$$

$$j. \sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$$

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

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

Section 3: Graphing review.

Quick Review		
Even Function	Symmetric about the y axis $f(-x) = f(x)$ for all x	Example: $y = x^2$ 
Odd Function	Symmetric about the origin (equivalent to a rotation of 180 degrees) $f(-x) = -f(x)$ for all x	Example: $y = x^3$ 

18. Determine algebraically whether each of the following is even or odd.

a. $f(x) = \frac{4x}{x^2 - 3}$

b. $f(x) = \frac{4x}{x - 3}$

c. $f(x) = \frac{4x^2}{x^4 - 3}$

19. You should know the graphs of the basic functions. Graph the following:

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

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

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

Section 4: Linear Functions

20. Write the equation of the line through (3, 5) with slope $-\frac{2}{3}$. Write your answer in point-slope form.

21. Write the equation of the line through (2, -3) and (-4, 1) in point-slope form.

22. The slope of a line is $-\frac{1}{2}$ and the line passes through the points (2, 5) and (-4, y). Find y.

Section 5: Average Rate of Change

23. Find the average speed of a car that has traveled 350 miles in 7 hours.

24. Suppose $f(1) = 2$ and the average rate of change of f between 1 and 5 is 3. Find $f(5)$.

Section 6: Graphing Calculator Skills

You should be able to do the following using the appropriate functions on your graphing calculator.

- Find an appropriate viewing rectangle for any function so that you can see a complete graph.
- Find x -intercepts (zeros) of a function. These are points.
- Find the intersection of 2 functions. These are points.
- Find the relative maximum or minimum value of a function. Remember that relative max/min value is the y -coordinate of the point.

25. Given $y = x^3 - 15x + 2$

- a) Find the appropriate viewing window to see a complete graph.
- b) Find the x -intercepts, accurate to 3 decimal places.
- c) Find the relative maximum and minimum values, accurate to 3 decimal places

26. Find the coordinates of the intersection points for the functions $f(x) = x + 3$, $g(x) = -x^2 - x + 7$

Answers

Section 1: Algebra Review

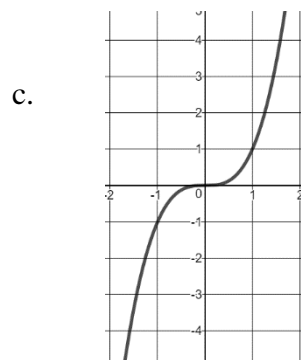
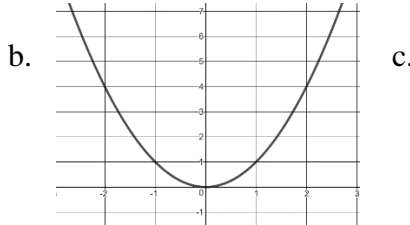
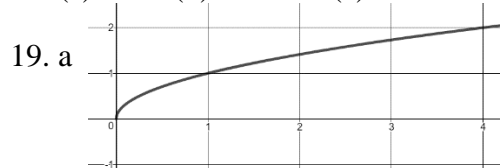
- $y = \frac{3x+2}{x-3}$
- $y = (2x+3)(4x^2 - 6x + 9)$
- $y = 3\sqrt{x}(x - 3 + \frac{6}{x})$
- $10x + 5h$
- $y = (x-3)(x+2)(x-2)$
- $\frac{x+4}{x(3x-1)}$
- $x = -\frac{2}{3}$
- $(x-1)^2(2x^2 - 7x - 9)$
- $\frac{3x^2-4x-1}{(x-1)^3}$
- $-\frac{1}{3+\sqrt{x+9}}$
- $\frac{1}{\sqrt{x+h}+\sqrt{x}}$
- $[1,5]$
- $(-\infty, -\frac{5}{2}) \cup (\frac{3}{2}, \infty)$
- $(-2, 5)$

Section 2: Trig Review

- $\sin^2 \theta + \cos^2 \theta = 1$; $\tan^2 \theta + 1 = \sec^2 \theta$; $\cot^2 \theta + 1 = \csc^2 \theta$
- (a) $-\frac{1}{\sqrt{2}}$ (b) $-\frac{1}{2}$ (c) $\frac{2}{\sqrt{3}}$ (d) 1 (e) -1 (f) -1 (g) $\frac{1}{2}$ (h) $\frac{\sqrt{3}}{2}$ (i) $-\frac{\sqrt{3}}{2}$ (j) $\frac{\pi}{3}$ (k) $\frac{2\pi}{3}$ (l) $-\frac{\pi}{4}$

Section 3: Graphing review

- (a) odd (b) neither (c) even



Section 4: Linear Functions

- $y - 5 = -\frac{2}{3}(x - 3)$
- $y + 3 = -\frac{2}{3}(x - 2)$ or $y - 1 = -\frac{2}{3}(x + 4)$
- $y = 8$

Section 5: Average Rate of Change

- 50 mph
- 14

Section 9: Graphing Calculator Skills

- (a) $x = [-6, 6]$, $y = [-30, 30]$
(b) $(-3.938, 0)$, $(0.133, 0)$, $(3.805, 0)$
(c) rel max: 24.361, rel min: -20.361
- $(-3.236, -0.236)$, $(1.236, 4.236)$