AP Precalculus Cheat Sheet

Unit 1: Polynomial and Rational Functions

- **Function:**
  - A single output for every input.
  - Rate of change from a to b: $\dfrac{f(b) - f(a)}{b - a} b - a$

- **Polynomial Functions:** Represented by sums of terms with variables raised to powers, e.g., f(x) = 2x⁴ − 2x³ + x² − 4x + 1.
  - **Degree:** Highest power of x (e.g., degree 4 for x⁴.
  - **Constant Polynomial:** Degree 0, e.g., f(x)=2f.
  - **Finding Zeros:** Use factorization, such as f(x) = (x − 1)(x − 2)(2x − 8).

- **Rational Functions:**
  - Ratio of two polynomial functions, e.g., $f(x) = \dfrac{1}{x - 3}$
  - **End Behavior:** Asymptotic behavior determined by the highest degree of the numerator and denominator.
  - **Zeros:** Set numerator equal to zero.

- **Transformations:**
  - Shifts and stretches/compressions.
  - Horizontal shift: f(x) = (x − 3)² (shifts right by 3 units).
  - Vertical stretch: f(x) = 2x²

Additional Notes:

Ex Examples.com

Unit 2: Exponential and Logarithmic Functions

- **Arithmetic Sequence:** Constant difference between terms, d.
- **Geometric Sequence:** Constant ratio between terms, r.
- **Exponential Functions:** $f(x) = ab^x$
  - **Decay:** When $0 < b < 1$.
  - **Growth:** When $b > 1$.
- **Key Properties:**
  - **Product Property:** $b^m \times b^n = b^{m+n}$
  - **Negative Exponent:** $b^{-n} = \dfrac{1}{b^n}$
- **Logarithmic Functions:**
  - Inverse of exponential functions.
- **Key Properties:**
  - **Product Property:** $\log_6(mn) = \log_6(m) + \log_6(n)$.
  - **Change of Base Property:** $\log_b(a) = \dfrac{\log_c(a)}{\log_c(b)}$

Additional Notes:

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Unit 3: Trigonometric and Polar Functions

- **Unit Circle:**
  - Radius 1, used to find angles and trigonometric values.

- **Basic Functions:**
  - Sine sin(θ) = y, Cosine cos(θ) = x, Tangent tan(θ) = $\dfrac{y}{x}$

- **Transformations:**
  - f(x) = asin (bx + c) + d for amplitude, period, phase shift, and vertical shift.

- **Trigonometric Identities:**
  - **Pythagorean Identity:** sin²(θ) + cos²(θ) = 1.
  - **Sum and Difference:** sin(a±b)= sin(a) cos(b) ± cos(a) sin(b).

- **Polar Coordinates:**
  - Points defined by a radius r and angle θ.
  - **Conversion to Cartesian: x = rcos (θ) , y = rsin (θ).**

Additional Notes:

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Unit 4: Functions Involving Parameters, Vectors, and Matrices

- **Parametric Equations:**
    - Describes motion with time as a parameter, e.g., $x(t)$ and $y(t)$.

- **Vectors:**
    - Defined by magnitude (length) and direction.
    - Operations: Addition, subtraction, scalar multiplication.

- **Matrices:**
    - Arrays of numbers arranged in rows and columns.
    - **Operations:** Addition, multiplication, determinant.

Additional Notes:

Ex Examples.com