

# ap calculus unit 8 review

**ap calculus unit 8 review** is an essential resource for students preparing for the AP Calculus exam, particularly in understanding the concepts of parametric, polar, and vector functions. This unit encompasses a variety of critical topics that are vital for mastering calculus applications. In this article, we will explore the key concepts covered in Unit 8, including the definitions, theorems, and techniques necessary for solving problems related to these functions. Additionally, we will provide a comprehensive review of important formulas and strategies to aid in exam preparation. Understanding these topics will not only enhance your calculus skills but also boost your confidence going into the exam.

The following sections will provide a detailed breakdown of the content covered in Unit 8, including a review of parametric equations, polar coordinates, and vector functions. We will also touch on applications of these concepts and provide helpful tips for effective studying.

- Understanding Parametric Equations
- Exploring Polar Coordinates
- Mastering Vector Functions
- Applications of Parametric and Polar Functions
- Effective Study Strategies for Unit 8

## Understanding Parametric Equations

Parametric equations are a powerful way to express curves in the Cartesian plane. Instead of defining a function  $y = f(x)$  in terms of  $x$ , parametric equations define both  $x$  and  $y$  in terms of a third variable, commonly denoted as  $t$ . This approach allows for the representation of more complex curves that cannot be easily expressed as a single function.

The standard form of parametric equations consists of two equations:  $x = f(t)$  and  $y = g(t)$ . Here,  $t$  is known as the parameter. A key concept in working with parametric equations is understanding how to eliminate the parameter to find a Cartesian equation. This can often be done by solving one of the equations for  $t$  and substituting into the other equation.

## Key Concepts in Parametric Equations

Some important concepts and techniques related to parametric equations include:

- **Finding derivatives:** To find the derivative of  $y$  with respect to  $x$ , you can use the chain rule:  $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$ .
- **Arc length:** The arc length  $L$  of a parametric curve can be calculated using the formula  $L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$ .

$$\int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt).$$

- **Applications:** Parametric equations are often used in physics to describe motion and in engineering for modeling curves.

## Exploring Polar Coordinates

Polar coordinates offer a different perspective on representing points in the plane, utilizing a distance from a reference point (the pole) and an angle from a reference direction (the polar axis). Polar coordinates are defined as  $(r, \theta)$ , where  $r$  is the radial distance and  $\theta$  is the angle.

Converting between Cartesian and polar coordinates is a fundamental skill in this unit. The relationships are defined as follows:

- **From polar to Cartesian:**  $x = r \cos(\theta)$  and  $y = r \sin(\theta)$ .
- **From Cartesian to polar:**  $r = \sqrt{x^2 + y^2}$  and  $\theta = \tan^{-1}\left(\frac{y}{x}\right)$ .

## Applications of Polar Coordinates

Understanding polar coordinates is essential for solving problems involving curves defined in polar form, such as circles, spirals, and roses. The ability to sketch and analyze these shapes requires familiarity with the polar coordinate system.

Additionally, calculating areas and lengths in polar coordinates involves different methods compared to Cartesian coordinates. For example, the area  $A$  enclosed by a polar curve can be calculated using the formula:

$$A = \frac{1}{2} \int_{\alpha}^{\beta} r^2 d\theta.$$

## Mastering Vector Functions

Vector functions are another critical component of AP Calculus Unit 8. They are used to describe motion in three-dimensional space. A vector function is typically expressed in the form  $\mathbf{r}(t) = \langle x(t), y(t), z(t) \rangle$ , where  $x(t)$ ,  $y(t)$ , and  $z(t)$  are functions of the parameter  $t$ .

Key concepts in vector functions include:

- **Finding derivatives:** The derivative of a vector function  $\mathbf{r}(t)$  is found by differentiating each component:  $\mathbf{r}'(t) = \langle x'(t), y'(t), z'(t) \rangle$ .
- **Arc length:** Similar to parametric equations, the arc length of a vector function can be calculated using the integral:  $L = \int_a^b |\mathbf{r}'(t)| dt$ .
- **Applications:** Vector functions are frequently used in physics to model the trajectory of objects

in motion.

## Applications of Parametric and Polar Functions

Both parametric and polar functions have numerous applications in various fields such as physics, engineering, and computer graphics. Understanding these applications is crucial for solving real-world problems.

In physics, parametric equations can describe the trajectory of a projectile, allowing for calculations of height, distance, and time. Polar coordinates can be particularly useful in fields such as robotics and navigation, where positions are often defined in terms of angles and distances.

## Effective Study Strategies for Unit 8

To successfully prepare for the AP Calculus exam, especially Unit 8, students should adopt effective study strategies. Here are some recommended approaches:

- **Practice Problems:** Work through a variety of problems related to parametric, polar, and vector functions to build familiarity and confidence.
- **Utilize Visual Aids:** Graphing tools can help visualize parametric and polar equations, aiding in understanding their behavior.
- **Review Theorems and Formulas:** Create a summary sheet of key formulas and theorems for quick reference during study sessions.
- **Group Study:** Collaborate with peers to discuss challenging concepts and share different problem-solving approaches.

With a comprehensive understanding of the topics covered in AP Calculus Unit 8, students can approach their studies with confidence. Mastering parametric, polar, and vector functions will not only serve well on the exam but also provide a strong foundation for future calculus applications.

## Q: What are parametric equations?

A: Parametric equations are a way of expressing the coordinates of points on a curve using a third variable, typically denoted as  $t$ . Instead of defining  $y$  in terms of  $x$ , both  $x$  and  $y$  are defined as functions of  $t$ . This allows for the representation of more complex shapes that may not be expressible as a single function.

## Q: How do you convert between polar and Cartesian coordinates?

A: To convert from polar to Cartesian coordinates, use the formulas  $x = r \cos(\theta)$  and  $y = r \sin(\theta)$ . To convert from Cartesian to polar coordinates, use  $r = \sqrt{x^2 + y^2}$  and  $\theta = \tan^{-1}\left(\frac{y}{x}\right)$ .

## Q: What is the significance of vector functions in calculus?

A: Vector functions are significant because they allow for the representation of motion in three-dimensional space. They express a position as a function of time, incorporating changes in all three dimensions, which is essential in physics and engineering.

## Q: How can I find the arc length of a parametric curve?

A: The arc length  $L$  of a parametric curve defined by  $x(t)$  and  $y(t)$  can be calculated using the formula:  $L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$ , where  $a$  and  $b$  are the parameter bounds.

## Q: What are some practical applications of polar coordinates?

A: Polar coordinates are used in various fields, including robotics for navigation, computer graphics for rendering circular shapes, and physics for analyzing circular motion. They simplify calculations involving angles and distances from a central point.

## Q: What study strategies can help with Unit 8 of AP Calculus?

A: Effective study strategies for Unit 8 include practicing a variety of problems, utilizing graphing tools to visualize functions, reviewing key theorems and formulas, and engaging in group study sessions to enhance understanding through discussion.

## Q: What should I focus on when studying vector functions?

A: When studying vector functions, focus on understanding their components, how to differentiate them, calculating their arc lengths, and their applications in modeling motion. Familiarity with the notation and operations involving vectors is also crucial.

## Q: How do you find the area enclosed by a polar curve?

A: The area  $A$  enclosed by a polar curve can be calculated using the formula:  $A = \frac{1}{2} \int_{\alpha}^{\beta} r^2 d\theta$ , where  $r$  is the polar function and  $\alpha$  and  $\beta$  are the bounds for  $\theta$ .

## Q: Why are parametric equations important in calculus?

A: Parametric equations are important because they allow for the modeling of curves and trajectories that are more complex than those expressible with traditional functions. They are widely used in physics and engineering to describe motion and behavior of objects.

## [Ap Calculus Unit 8 Review](#)

Find other PDF articles:

<http://www.speargroupplc.com/business-suggest-005/files?trackid=kKJ02-6702&title=business-checking-account-td-bank.pdf>

**ap calculus unit 8 review:** ACE AP Calculus BC Ritvik Rustagi, 2024-03-17 The ACE AP Calculus BC book, written by Ritvik Rustagi, contains over 190 pages and over 150 problems and covers all the important topics for the AP exam. There are detailed solutions for every problem. The goal of this book is to make reviewing for the AP exams efficient. Many students often struggle with balancing various AP exams and approaching these tough problems efficiently. However, that is when the book comes in. It contains all the necessary topics to assist people in their calculus journey. This book can also be used for a traditional Calculus 1 class. It is not just limited to the AP class.

**ap calculus unit 8 review:** 5 Steps to a 5: AP Calculus BC 2023 William Ma, 2022-08-01 AP Teachers' #1 Choice! Ready to succeed in your AP course and ace your exam? Our 5 Steps to a 5 guides explain the tough stuff, offer tons of practice and explanations, and help you make the most efficient use of your study time. 5 Steps to a 5: AP Calculus BC is more than a review guide, it's a system that has helped thousands of students walk into test day feeling prepared and confident. Everything you Need for a 5: 3 full-length practice tests that align with the latest College Board requirements Hundreds of practice exercises with answer explanations Comprehensive overview of all test topics Proven strategies from seasoned AP educators Study on the Go: All instructional content in digital format (for both computers and mobile devices) Interactive practice tests with answer explanations A self-guided study plan with daily goals, powerful analytics, flashcards, games, and more A Great In-class Supplement: 5 Steps is an ideal companion to your main AP text Includes an AP Calculus BC Teacher's Manual that offers excellent guidance to educators for better use of the 5 Steps resources

**ap calculus unit 8 review:** 5 Steps to a 5: AP Calculus BC 2024 Elite Student Edition William Ma, Emily Pillar, 2023-07-31 AP Teachers' #1 Choice! Ready to succeed in your AP course and ace your exam? Our 5 Steps to a 5 guides explain the tough stuff, offer tons of practice and explanations, and help you make the most efficient use of your study time. 5 Steps to a 5: AP Calculus BC Elite Student Edition is more than a review guide, it's a system that has helped thousands of students walk into test day feeling prepared and confident. Everything You Need for a 5: 3 full-length practice tests that align with the latest College Board requirements Hundreds of practice exercises with answer explanations Comprehensive overview of all test topics Proven strategies from seasoned AP educators Why the Elite Edition? 200+ pages of additional AP content 5-minute daily activities to reinforce critical AP concepts AP educators love this feature for bellringers in the classroom! Study on the Go: All instructional content in digital format (available online and on mobile devices) Interactive practice tests with answer explanations A self-guided, personalized study plan with daily goals, powerful analytics, flashcards, games, and more A Great In-class Supplement: 5 Steps is an

ideal companion to your main AP text Includes an AP Calculus BC Teacher's Manual that offers excellent guidance to educators for better use of the 5 Steps resources

**ap calculus unit 8 review: 5 Steps to a 5: AP Calculus BC 2024** William Ma, Emily Pillar, 2023-07-31 AP Teachers' #1 Choice! Ready to succeed in your AP course and ace your exam? Our 5 Steps to a 5 guides explain the tough stuff, offer tons of practice and explanations, and help you make the most efficient use of your study time. 5 Steps to a 5: AP Calculus BC is more than a review guide, it's a system that has helped thousands of students walk into test day feeling prepared and confident. Everything You Need for a 5: 3 full-length practice tests that align with the latest College Board requirements Hundreds of practice exercises with answer explanations Comprehensive overview of all test topics Proven strategies from seasoned AP educators Study on the Go: All instructional content in digital format (available online and on mobile devices) Interactive practice tests with answer explanations A self-guided, personalized study plan with daily goals, powerful analytics, flashcards, games, and more A Great In-class Supplement: 5 Steps is an ideal companion to your main AP text Includes an AP Calculus BC Teacher's Manual that offers excellent guidance to educators for better use of the 5 Steps resources

**ap calculus unit 8 review: 5 Steps to a 5: AP Calculus AB 2024** William Ma, Emily Pillar, 2023-07-31 AP Teachers' #1 Choice! Ready to succeed in your AP course and ace your exam? Our 5 Steps to a 5 guides explain the tough stuff, offer tons of practice and explanations, and help you make the most efficient use of your study time. 5 Steps to a 5: AP Calculus AB is more than a review guide, it's a system that has helped thousands of students walk into test day feeling prepared and confident. Everything You Need for a 5: 3 full-length practice tests that align with the latest College Board requirements Hundreds of practice exercises with answer explanations Comprehensive overview of all test topics Proven strategies from seasoned AP educators Study on the Go: All instructional content in digital format (available online and on mobile devices) Interactive practice tests with answer explanations A self-guided, personalized study plan with daily goals, powerful analytics, flashcards, games, and more A Great In-class Supplement: 5 Steps is an ideal companion to your main AP text Includes an AP Calculus AB Teacher's Manual that offers excellent guidance to educators for better use of the 5 Steps resources

**ap calculus unit 8 review: Workshop Calculus** Nancy Baxter Hastings, 1998 Based on the Workshop Mathematics approach which focuses on interactive learning -- learning by doing -- this volume covers topics in calculus while reviewing precalculus concepts. The reader is encouraged to make observations and connections while exploring data and experimenting through the graphing calculator.

**ap calculus unit 8 review: 5 Steps to a 5: AP Calculus AB 2024 Elite Student Edition** William Ma, Emily Pillar, 2023-07-31 AP Teachers' #1 Choice! Ready to succeed in your AP course and ace your exam? Our 5 Steps to a 5 guides explain the tough stuff, offer tons of practice and explanations, and help you make the most efficient use of your study time. 5 Steps to a 5: AP Calculus AB Elite Student Edition is more than a review guide, it's a system that has helped thousands of students walk into test day feeling prepared and confident. Everything You Need for a 5: 3 full-length practice tests that align with the latest College Board requirements Hundreds of practice exercises with answer explanations Comprehensive overview of all test topics Proven strategies from seasoned AP educators Why the Elite Edition? 200+ pages of additional AP content 5-minute daily activities to reinforce critical AP concepts AP educators love this feature for bellringers in the classroom! Study on the Go: All instructional content in digital format (available online and on mobile devices) Interactive practice tests with answer explanations A self-guided, personalized study plan with daily goals, powerful analytics, flashcards, games, and more A Great In-class Supplement: 5 Steps is an ideal companion to your main AP text Includes an AP Calculus AB Teacher's Manual that offers excellent guidance to educators for better use of the 5 Steps resources

**ap calculus unit 8 review: Applied Mechanics Reviews** , 1973

**ap calculus unit 8 review: *Workshop Calculus with Graphing Calculators*** Nancy Baxter Hastings, 2012-12-06 This project is based on the use of graphing calculators by students enrolled in

calculus. There is enough material in the book to cover precalculus review, as well as first year single variable calculus topics. Intended for use in workshop-centered calculus courses. Developed as part of the well-known NSF-sponsored project, Workshop Mathematics, the text is intended for use with students in a math laboratory, instead of a traditional lecture course. There are student-oriented activities, experiments and graphing calculator exercises found throughout the text. The authors are well-known teachers and innovative thinkers about ways to improve undergraduate mathematics teaching.

**ap calculus unit 8 review:** ACE AP Calculus AB Ritvik Rustagi, 2024-03-17 The ACE AP Calculus AB book contains over 190 pages and over 150 problems and covers all the important topics for the AP exam. There are detailed solutions for every problem. The goal of this book is to make reviewing for the AP exams efficient. Many students often struggle with balancing various AP exams and approaching these tough problems efficiently. However, that is when the book comes in. It contains all the necessary topics to assist people in their calculus journey. This book can also be used for a traditional Calculus 1 class. It is not just limited to the AP class.

**ap calculus unit 8 review: Technical Book Review Index** , 1942

**ap calculus unit 8 review:** AP CALCULUS The Ripple Effect Engin Savaş, 2025-08-30 AP Calculus The Ripple Effect is a comprehensive four-part program designed for AP Calculus AB & BC students preparing for the digital exam. This book takes learners from first principles all the way to full exam readiness with clear explanations, worked examples, practice sets, and strategic exam training. Part I: Core Units Covers every AP Calculus AB & BC topic in detail. Each topic includes a concise explanation, a fully worked example, and practice problems. Every 3–4 topics include a Checkpoint for targeted review. Each unit ends with 4 full-length tests (the final unit includes 3). Part II: Calculator Mastery Hub Created with special permission from Desmos Studio. Teaches 12 essential Desmos skills aligned with the digital AP exam. Includes strategic demonstrations, test-ready applications, and visual graphing references. Bridges the gap between TI-84 usage and the new digital exam format. Part III: FRQ Strategy Room Master the 10 classic FRQ missions that appear year after year. Each mission includes signals to recognize the question type, required strategies, and a rubric-style worked solution. Helps students avoid common traps and write rubric-ready justifications. Part IV: Final Challenge Vault Contains the most selective and exam-like MCQs, divided into calculator and non-calculator sections. Includes one full-length AB practice exam and one BC practice exam matching real test timing and difficulty. Designed to push top students aiming for a 5 to their highest potential. Why This Book? □ 430+ pages, 400+ practice problems, checkpoints, and unit tests □ Balanced for both AB and BC exam formats □ Structured, progressive learning—from concept to mastery □ Designed by Engin Savaş, experienced AP Calculus teacher and content developer Whether you are beginning your AP Calculus journey or pushing for a top score, AP Calculus The Ripple Effect is your complete companion for the digital AP Calculus exam.

**ap calculus unit 8 review:** The Electrical Review , 1926

**ap calculus unit 8 review: Cracking the A. P. Calculus** David Kahn, 1998-01-15 THE BOOK THAT GETS YOU RESULTS \*Includes two full-length AP Calculus practice tests, one each for the AB & BC exams. \*Sharpen your skills with more than 900 practice questions. \*Review the essential calculus covered on the exam. WE KNOW THE AP CALCULUS AB & BC EXAMS The experts at The Princeton Review study the AP Calculus exam and other standardized tests each year to make sure you get the most up-to-date, thoroughly researched books possible. WE KNOW STUDENTS Each year we help more than two million students score high with our courses, bestselling books, and award-winning software. WE GET RESULTS Students who take our courses for the SAT, GRE, LSAT, and many other tests see score improvements that have been verified by independent accounting firms. The proven techniques we teach in our courses are in this book. AND IF IT'S ON THE AP CALCULUS EXAM, IT'S IN THIS BOOK We don't try to teach you everything there is to know about calculus-only the facts and techniques you'll need to know to score high on the Advanced Placement exam. There's a big difference. In Cracking the AP Calculus AB & BC, 1998-1999 Edition, you will learn to think like the test-makers and: \*Review and practice the calculus concepts that are covered

on the exam \*Score higher by mastering a few essential problem-solving techniques \*Immediately recognize problem types and recall the techniques that are needed to solve them \*Memorize important formulas so you won't have to rely on your calculator \*Become a test-taking expert by practicing on the more than 900 problems in this book Practice your skills on the full-length sample tests inside (one each for both the AB and BC exams). The questions are just like the ones you'll see on the actual AP Calculus exam, and we fully explain every answer.

**ap calculus unit 8 review:** *New York Review of the Telegraph and Telephone and Electrical Journal* , 1908

**ap calculus unit 8 review:** *Register of the University of California* University of California (1868-1952), 1957

**ap calculus unit 8 review:** *Resources in Education* , 2001-04

**ap calculus unit 8 review:** *Catalog of Copyright Entries. Third Series* Library of Congress. Copyright Office, 1963 Includes Part 1, Number 1: Books and Pamphlets, Including Serials and Contributions to Periodicals (January - June)

**ap calculus unit 8 review:** *General Catalog* University of Missouri, 1915

**ap calculus unit 8 review:** *The Catholic Periodical Index* Laurence Andrew Michael Leavey, 1939

## Related to ap calculus unit 8 review

**Associated Press News: Breaking News, Latest Headlines and Videos | AP** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news

**The Associated Press | Video, Photo, Text, Audio & Data News** Tap into AP's expertise to create content for your brand, cover worldwide events, and access full production and editorial solutions with AP's unrivaled network of studios and temporary facilities

**Global News: Latest and Breaking Headlines | AP News** 3 days ago LONDON (AP) — Britain will require all workers to have a digital identification card by the end of this parliamentary

**News Highlights - The Associated Press** After a U.S. military strike on a suspected drug boat off Venezuela's coast, an all-formats AP team delivered the first on-the-ground report from the remote Paria Peninsula — the departure point

**Breaking News Archives | The Associated Press** AP dominates coverage of explosive Gen Z-led protests in Nepal that forced the prime minister to resign SEPT. 19, 2025 Find out more

**About Us | The Associated Press** Independent, nonpartisan and accurate since 1846. AP today remains the most trusted source of independent, nonpartisan and factual news in all formats and the essential provider of the

**Advanced Placement® (AP) - College Board** AP gives students the chance to tackle college-level work while still in high school and earn college credit and placement

**Associated Press - Wikipedia** The Associated Press (AP) [4] is an American not-for-profit news agency headquartered in New York City. Founded in 1846, it operates as a cooperative, unincorporated association, and

**U.S. News: Top U.S. News Today | AP News** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news

**AP News: UK & Worldwide Breaking News** Stay updated with the latest headlines, breaking news, and videos at APNews.com, your go-to source for unbiased journalism from around the world

**Associated Press News: Breaking News, Latest Headlines and Videos | AP** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news business.

**The Associated Press | Video, Photo, Text, Audio & Data News** Tap into AP's expertise to create content for your brand, cover worldwide events, and access full production and editorial solutions with AP's unrivaled network of studios and temporary facilities

**Global News: Latest and Breaking Headlines | AP News** 3 days ago LONDON (AP) — Britain will require all workers to have a digital identification card by the end of this parliamentary

**News Highlights - The Associated Press** After a U.S. military strike on a suspected drug boat off Venezuela's coast, an all-formats AP team delivered the first on-the-ground report from the remote Paria Peninsula — the departure point

**Breaking News Archives | The Associated Press** AP dominates coverage of explosive Gen Z-led protests in Nepal that forced the prime minister to resign SEPT. 19, 2025 Find out more

**About Us | The Associated Press** Independent, nonpartisan and accurate since 1846. AP today remains the most trusted source of independent, nonpartisan and factual news in all formats and the essential provider of the

**Advanced Placement® (AP) - College Board** AP gives students the chance to tackle college-level work while still in high school and earn college credit and placement

**Associated Press - Wikipedia** The Associated Press (AP) [4] is an American not-for-profit news agency headquartered in New York City. Founded in 1846, it operates as a cooperative, unincorporated association, and

**U.S. News: Top U.S. News Today | AP News** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news business.

**AP News: UK & Worldwide Breaking News** Stay updated with the latest headlines, breaking news, and videos at APNews.com, your go-to source for unbiased journalism from around the world

**Associated Press News: Breaking News, Latest Headlines and Videos | AP** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news business.

**The Associated Press | Video, Photo, Text, Audio & Data News** Tap into AP's expertise to create content for your brand, cover worldwide events, and access full production and editorial solutions with AP's unrivaled network of studios and temporary facilities

**Global News: Latest and Breaking Headlines | AP News** 3 days ago LONDON (AP) — Britain will require all workers to have a digital identification card by the end of this parliamentary

**News Highlights - The Associated Press** After a U.S. military strike on a suspected drug boat off Venezuela's coast, an all-formats AP team delivered the first on-the-ground report from the remote Paria Peninsula — the departure point

**Breaking News Archives | The Associated Press** AP dominates coverage of explosive Gen Z-led protests in Nepal that forced the prime minister to resign SEPT. 19, 2025 Find out more

**About Us | The Associated Press** Independent, nonpartisan and accurate since 1846. AP today remains the most trusted source of independent, nonpartisan and factual news in all formats and the essential provider of the

**Advanced Placement® (AP) - College Board** AP gives students the chance to tackle college-level work while still in high school and earn college credit and placement

**Associated Press - Wikipedia** The Associated Press (AP) [4] is an American not-for-profit news agency headquartered in New York City. Founded in 1846, it operates as a cooperative, unincorporated association, and

**U.S. News: Top U.S. News Today | AP News** Founded in 1846, AP today remains the most trusted source of fast, accurate, unbiased news in all formats and the essential provider of the technology and services vital to the news business.

**AP News: UK & Worldwide Breaking News** Stay updated with the latest headlines, breaking news, and videos at APNews.com, your go-to source for unbiased journalism from around the world