COURSE NAME

LECTURE 01 – Project

Subtitle

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DD Month YYYY

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The Sine Function

The sine function is a fundamental trigonometric function that relates angles to ratios of side lengths in right triangles.

- ▶ Definition: For an angle θ in a right triangle, $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$

- ▶ Unit circle: On the unit circle, $\sin(\theta)$ is the y-coordinate of the point at angle θ

- ▶ Range: The sine function takes values in $[-1, 1]$

- ▶ Periodicity: $\sin(\theta + 2\pi) = \sin(\theta)$ for all θ

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Theorem: Fundamental Theorem of Calculus

Part I: If f is continuous on $[a, b]$ and F is defined by

$$F(x) = \int_a^x f(t)\, dt,$$

then F is differentiable on (a, b) and $F'(x) = f(x)$.

Part II: If f is continuous on $[a, b]$ and F is any antiderivative of f on $[a, b]$, then

$$\int_a^b f(x)\, dx = F(b) - F(a).$$

(This theorem connects the two main operations of calculus.)

Prime Number Sieve

Sieve of Eratosthenes

```python
def sieve_of_eratosthenes(n):
    # Create a boolean array for prime numbers
    is_prime = [True] * (n + 1)
    is_prime[0] = is_prime[1] = False

    # Sieve algorithm
    for i in range(2, int(n**0.5) + 1):
        if is_prime[i]:
            # Mark multiples of i as non-prime
            for j in range(i*i, n + 1, i):
                is_prime[j] = False

    # Collect all prime numbers
    primes = [i for i in range(2, n + 1) if is_prime[i]]
    return primes

# Find all primes up to 100
primes = sieve_of_eratosthenes(100)
print(primes)
```

Summary

- ► Summary point 1

- ► Summary point 2

- ► Summary point 3

- ► Summary point 4

Thank you!