**Lecture**

Fundamental Theorem of Calculus (Khan Acadmey)

|  |  |  |
| --- | --- | --- |
|  | **Topic** | **Score (0/1)** |
| 1 | Connection between definite integrals and derivatives |  |
| 2 | Say we have a continuous function f on interval [a, b] |  |
| 3 | Closed interval that includes a and b |  |
| 4 | Graph of function |  |
| 5 | Lower bound a on graph |  |
| 6 | Upper bound b on graph |  |
| 7 | Define a new function that’s the area under the curve between a and some point in our interval |  |
| 8 | Pick a point, x in interval [a,b] |  |
| 9 | Denote area under curve between two end points with integral |  |
| 10 |  |  |
| 11 | This is also a function of x, F(x) |  |
| 12 | Fundamental theorem of calculus |  |
| 13 |  |  |
| 14 | Every continuous function f has an antiderivative F(x) |  |
| 15 | Connection between derivative / integration |  |
| 16 | Taking the definite integral is essentially taking an antiderivative |  |
| 17 | Example of applying fundamental theorem of calculus |  |
| 18 | Find derivative of the integral of crazy looking expression |  |
| 19 |  |  |
| 20 |  |  |
| 21 | Replace t with x |  |
| 22 | Solution becomes f(x) instead of f(t) |  |
| 23 |  |  |
| 24 | It does not matter what the lower boundary is. |  |
| 25 | Introduction about next videos |  |
| 26 | Next videos will talk about intuition and more examples using fundamental theorem of calculus |  |

**Total Score**

**Lecture**

Proving Trigonometry Formulas from Euler’s Formula (Lee Stemkoski)

|  |  |  |
| --- | --- | --- |
|  | **Topic** | **Score (0/1)** |
| 1 | Proving trigonometric formulas using Euler’s formula |  |
| 2 | Proof of |  |
| 3 | Euler’s formula: |  |
| 4 |  |  |
| 5 |  |  |
| 6 | cos is even function: cos(x) = cos(-x) |  |
| 7 | sin is odd function: sin(x) = -sin(x) |  |
| 8 | Proof of angle sum formula |  |
| 9 |  |  |
| 10 |  |  |
| 11 |  |  |
| 12 | If two complex numbers are equal, their real and their imaginary parts must also be equal |  |
| 13 |  |  |
| 14 |  |  |
| 15 | Double angle formulas |  |
| 16 |  |  |
| 17 |  |  |
| 18 |  |  |

**Total Score**

**Lecture**

Uniform Distribution (Actuarial Path)

|  |  |  |
| --- | --- | --- |
|  | **Topic** | **Score (0/1)** |
| 1 | Properties/Moments/Parameters of Uniform distribution and their derivation |  |
| 2 | Random variable X following uniform distribution with parameters a and b |  |
| 3 | Graph of probability distribution (PDF) of X is flat, constant function |  |
| 4 | Area under PDF is equal to 1 (valid probability distribution function) |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 | CDF of X |  |
| 9 |  |  |
| 10 |  |  |
| 11 |  |  |
| 12 |  |  |
| 13 |  |  |
| 14 |  |  |
| 15 | Derivation of CDF |  |
| 16 | , probability that X takes value less than x |  |
| 17 | if since x cannot take values less than *a* |  |
| 18 | When , |  |
| 19 |  |  |
| 20 | The CDF at x=b, |  |
| 21 | When x > b, |  |
| 22 | Deriving the CDF from area of rectangle under graph |  |
| 23 |  |  |

**Total Score**

**Lecture**

Moment Method Estimation (Machine Intelligence Wiki)

|  |  |  |
| --- | --- | --- |
|  | **Topic** | **Score (0/1)** |
| 1 | Deriving estimators of the parameters of uniform distribution using the method of moments |  |
| 2 | Uniform distribution |  |
| 3 | Bounds of variable x |  |
| 4 | First two moments based on PDF |  |
| 5 | Expectation of x |  |
| 6 |  |  |
| 7 |  |  |
| 8 | Second moment |  |
| 9 |  |  |
| 10 |  |  |
| 11 |  |  |
| 12 | Sample moment (mean) |  |
| 13 |  |  |
| 14 | Sample second moment |  |
| 15 |  |  |
| 16 | Expectation of x equal to sample mean |  |
| 17 |  |  |
| 18 | Expectation of x2 equal to sample second moment |  |
| 19 |  |  |
| 20 | Solve for a and b |  |
| 21 |  |  |
| 22 | Estimator of a |  |
| 23 |  |  |
| 24 | Plug in to the equation |  |
| 25 |  |  |
| 26 |  |  |
| 27 |  |  |
| 28 | Solve Quadratic equation in b |  |
| 29 | Estimator of b |  |
| 30 |  |  |
| 31 | Plug in to b to equation |  |
| 32 |  |  |
| 33 | is variance of the sample |  |
| 34 | Uniform distribution variable should be random |  |
| 35 | Estimator parameters a and b are linear combinations of mean and standard deviation of the sample |  |
| 36 |  |  |
| 37 |  |  |

**Total Score**