PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Numerical Methods - CSIR NET Physics PYQs

Mathematical Physics . All PYQs (2015-2025) with answer key

16 questions . Answer key included

www.physicsbyaaryan.com . www.csirnetphysics.com
Contact: 9501976811

Q1. [Dec 2015] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2015 Dec	5 M

The value of the integral $\int_0^8 \frac{1}{x^2+5} dx$, valuated using Simpson's $\frac{1}{3}$ rule with $h = 2$ is

1. 0.565
2. 0.620
3. 0.698
4. 0.736

Q2. [June 2015] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2015 June	5 M

Consider the differential equation $\frac{dy}{dx} = x^2 - y$ with the initial condition $y = 2$ at $x = 0$. Let $y_{(1)}$ and $y_{(1/2)}$ be the solutions at $x = 1$ obtained using Euler's forward algorithm with step size 1 and $\frac{1}{2}$ respectively.

The value of $\left(y_{(1)} - y_{(1/2)}\right)/y_{(1/2)}$ is

1. $-1/2$
2. -1
3. ½
4. 1

Q3. [Dec 2016] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2016 Dec	5M

Given the values $\sin 45^\circ = 0.7071$, $\sin 50^\circ = 0.7660$, $\sin 55^\circ = 0.8192$ and $\sin 60^\circ = 0.8660$, the approximate value of $\sin 52^\circ$, computed by Newton's forward difference method, is

1. 0.804
2. 0.776
3. 0.788
4. 0.798

Q4. [June 2016] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2016 June	5M

In finding the roots of the polynomial $f(x) = 3x^3 - 4x - 5$ using the iterative Newton-Raphson method, the initial guess is taken to be $x = 2$. In the next iteration its value is nearest to

1. 1.671
2. 1.656
3. 1.559
4. 1.551

Q5. [Dec 2017] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2017 Dec	5M

The differential equation $\frac{dy(x)}{dx} = \alpha x^2$, with the initial condition $y(0) = 0$, is solved using Euler's method. If $y_E(x)$ is the exact solution and $y_N(x)$ the numerical solution obtained using n steps of equal length, then the relative error $\left|\frac{(y_N(x) - y_E(x))}{y_E(x)}\right|$ is proportional to

1. $\frac{1}{n^2}$
2. $\frac{1}{n^3}$
3. $\frac{1}{n^4}$
4. $\frac{1}{n}$

Q6. [Dec 2017] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2017 Dec	5M

The interval $[0,1]$ is divided into n parts of equal length to calculate the integral $\int_0^1 e^{i2\pi x}dx$ using the trapezoidal rule. The minimum value of n for which the result is exact, is

1. 2
2. 3
3. 4
4. ∞

Q7. [June 2017] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2017 June	5M

The interval $[0,1]$ is divided into $2n$ parts of equal length to calculate the integral $\int_0^1 e^{i2\pi x}dx$ using Simpson's $\frac{1}{3}$ rule. What is the minimum value of n for the result to be exact?

1. ∞
2. 2
3. 3
4. 4

Q8. [Dec 2018] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2018 Dec	5M

The value of the integral $\int_0^1 x^2 dx$, evaluated using the trapezoidal rule with a step size of 0.2 , is

1. 0.30
2. 0.39
3. 0.34
4. 0.27

Q9. [June 2018] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2018 June	5M

The fractional error in estimating the integral $\int_0^1 x dx$ using Simpson's $\frac{1}{3}$ rule, using a step size 0.1, is nearest to

1. 10^{-4}
2. 0
3. 10^{-2}
4. 3×10^{-4}

Q10. [Dec 2019] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2019 Dec	5M

The positive zero of the polynomials $f(x) = x^2 - 4$ is determined using Newton-Raphson method, using initial guess $x = 1$. Let the estimate, after two iterations, be $x^{(2)}$. The percentage error $\left|\frac{x^{(2)}-2}{2}\right| \times 100\%$ is

1. 7.5%
2. 5.0%
3. 1.0%
4. 2.5%

Q11. [June 2019] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2019 June	5M

If the Newton-Raphson method is used to find the positive root of the equation $x = 2\sin x$, the iteration equation is

1. $x_{n+1} = \frac{2x_n - 2(\sin x_n + x_n \cos x_n)}{1 - 2\cos x_n}$
2. $x_{n+1} = \frac{2(\sin x_n - x_n \cos x_n)}{1 - 2\cos x_n}$
3. $x_{n+1} = \frac{x_n^2 - 1 + 2(\cos x_n - x_n \sin x_n)}{x_n - 2\sin x_n}$
4. $x_{n+1} = \frac{x_n^2 - 1 - 2(\cos x_n + \sin x_n)}{x_n - 2\sin x_n}$

Q12. [June 2020] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2020 June	5M

Using the following values of x and f(x) the integral $I = \int_0^{1.5} f(x)dx$, evaluated by the Trapezoidal rule, is 5/16. The value of a is

x	0	0.5	1.0	1.5
f(x)	1	a	0	−5/4

1. 3/4
2. 3/2
3. 7/4
4. 19/24

Q13. [June 2021] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2021 June	5M

The Newton-Raphson method is to be used to determine the reciprocal of the number $x = 4$. If we start with the initial guess 0.20 then after the first iteration the reciprocal is

1. 0.23
2. 0.24
3. 0.25
4. 0.26

Q14. [Dec 2023] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2023 Dec	5 M

Given the date points

x	1	3	5
y	4	28	92

Using Lagrange's method of interpolation, the value of y at $x = 4$ is closest to

1. 54
2. 55
3. 53
4. 56

Q15. [June 2023] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2023 June	5M

The bisection method is used to find a zero x_0 of the polynomial $f(x) = x^3 - x^2 - 1$. Since $f(1) = -1$, while $f(2) = 3$, the values $a = 1$ and $b = 2$ are chosen as the boundaries of the interval in which the x_0 lies. If the bisection method is iterated three times, the resulting value of x_0 is

1. 15/8
2. 13/8
3. 11/8
4. 9/8

Q16. [June 2024] . 5.0 marks

Mathematical Physics > Numerical Methods

CSIR NET	2024 June	5M

The integral $I = \int_0^1 \frac{2x}{1+x^2} dx$ is estimated using Simpson's $1/3$rd rule with a grid value of $h = 0.5$. The difference ($I_{\text{estimated}} - I_{\text{exact}}$) is closest to

1. 0.007
2. 0.001
3. 0.0007
4. -0.005

Answer Key

16 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Mathematical Physics	Numerical Methods	**1**
Q2	Mathematical Physics	Numerical Methods	**2**
Q3	Mathematical Physics	Numerical Methods	**3**
Q4	Mathematical Physics	Numerical Methods	**2**
Q5	Mathematical Physics	Numerical Methods	**4**
Q6	Mathematical Physics	Numerical Methods	**1**
Q7	Mathematical Physics	Numerical Methods	**2**
Q8	Mathematical Physics	Numerical Methods	**3**
Q9	Mathematical Physics	Numerical Methods	**2**
Q10	Mathematical Physics	Numerical Methods	**4**
Q11	Mathematical Physics	Numerical Methods	**2**
Q12	Mathematical Physics	Numerical Methods	**1**
Q13	Mathematical Physics	Numerical Methods	**2**
Q14	Mathematical Physics	Numerical Methods	**2**
Q15	Mathematical Physics	Numerical Methods	**3**
Q16	Mathematical Physics	Numerical Methods	**1**

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Contact
9501976811