**Department of Mathematics**
King Saud University

# M-106

Summer Semester(1433/1434)

## Final Exam

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| Name: | Number: |
| Name of Teacher: | Group No: |

Max Marks: 50 Time: Three hours

Marks:

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|---|---|
| Multiple Choice(1-20) | |
| Question # 21 | |
| Question # 22 | |
| Question # 24 | |
| Question # 25 | |
| Question # 26 | |
| Total | |

# Multiple Choice

| Q.NO: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {a,b,c,d} | | | | | | | | | | | | | | | | | | | | |

**Q.No:1** To evaluate the integral $\int \frac{\cos x}{\sqrt{1+\sin x}} dx$ , we use the substitution

(a) $u = \tan\left(\frac{x}{2}\right)$, (b) $u = \sqrt{1+\sin x}$ , (c) $u = 1+\sin x$ , (d) None of these.

**Q.No:2** $\frac{d}{dx}\left(\int_{x^2}^{2x} e^t dt\right)$ is equal to

(a) $2e^{2x} - 2xe^{x^2}$ (b) $2e^{2x} + 2xe^{x^2}$, (c) $e^{2x} - xe^{x^2}$, (d)None of these.

**Q.No:3** If $2\ln(x) = \ln(6x-8)$ then the value of x equals to

(a) 4 & -2 (b) -4 & 2 (c) 4 & 2 (d)None of these.

**Q.No:4** If $\sum_{k=1}^{4}(k+a) = 14$ then the value of a is equal to

(a) 1 (b) 2 (c) 4 (d)None of these.

**Q.No:5** $\int_{-1}^{0} 3^x dx$ is equal to

(a) $\frac{3\ln 3}{2}$ (b) $\frac{1}{3\ln 3}$ (c) $\frac{2}{3\ln 3}$ (d)None of these.

**Q.No:6** $\int \frac{e^x}{\sqrt{1+e^{2x}}} dx$ is equal to

(a) $\frac{1}{2}\sin^{-1}\left(e^{2x}\right)+c$ (b) $\cosh^{-1}\left(e^x\right)+c$ (c) $\sinh^{-1}\left(e^{2x}\right)+c$ (d)None of these.

**Q.No:7** The domain of the function $f(x) = \ln\left(\frac{1}{x}\right)$ is

(a) $(-\infty, 0)$ (b) $(1, \infty)$ (c) $(0, \infty)$ (d)None of these.

**Q.No:8** If $f(x) = \tan^{-1}(\sinh x)$, then $f'(x)$ is equal to

(a) $\dfrac{-\cos x}{1+\sinh^2 x}$ (b) $\dfrac{\cos hx}{1+\sinh^2 x}$ (c) $\dfrac{1}{1+\sinh^2 x}$ (d)None of these.

**Q.No:9** $\underset{x\to\infty}{Lim}\left(e^{-x}x\right)$ is equal to

(a) 0 (b) $-1$ (c) 1 (d)None of these.

**Q.No:10** $\int x \sin x dx$ is equal to

(a) $-x\cos x + \sin x + c$ (b) $-x\cos x - \sin x + c$ (c) $x\cos x + \sin x + c$ (d)None of these.

**Q.No:11** The partial fractions decomposition of $\dfrac{x+2}{x(1-x^2)}$ is

(a) $\dfrac{A}{x}+\dfrac{Bx+C}{1-x^2}$ (b) $\dfrac{A}{x}+\dfrac{B}{1-x^2}$ (c) $\dfrac{A}{x}+\dfrac{B}{1-x}+\dfrac{C}{1+x}$ (d)None of these

**Q.No:12** The integral $\int(\cos^2 x - \sin^2 x)dx$ is equal to

(a) $\dfrac{\cos^3 x}{3}-\dfrac{\sin^3 x}{3}+c$ (b) $\dfrac{\sin 2x}{2}+c$ (c) $-\dfrac{\sin 2x}{2}+c$ (d)None of these

**Q.No:13** The substitution $u = 1-\sqrt{x}$ transforms $\int\dfrac{1}{1-\sqrt{x}}dx$

(a) $\int\dfrac{2(1-u)}{u}du$ (b) $\int\dfrac{-2(1+u)}{u}du$ (c) $\int\dfrac{-2(1-u)}{u}du$ (d)None of these.

**Q.No:14** The area of the region bounded by the graphs of $y = x$, $x = 2$ and $y = 0$ is

(a) 2 (b) 0 (c) 1 (d)None of these.

**Q.No:15** The length of the curve $y = x$ from $x = 0$ to $x = 3$ equals to

(a) $3\sqrt{2}$ (b) 3 (c) $\dfrac{14}{3}$ (d)None of these.

**Q.No:16** The arc length of the polar curve $r = 2\sin\theta$, $0 \le \theta \le \frac{\pi}{2}$ equals to

(a) $\pi$ (b) $2\pi$ (c) $\frac{\pi}{2}$ (d)None of these.

**Q.No:17** The slope of the tangent line to the curve $C : x = \sin t, y = \cos t$ at $t = \frac{\pi}{4}$ equals

(a) 0 (b) 2 (c) $-1$ (d)None of these

**Q.No:18** If $(r,\theta) - coordinate$ of points are $\left(2, \frac{\pi}{6}\right)$ then $(x, y) - coordinates$ are

(a) $\left(\sqrt{3}, 1\right)$ (b) $(1,1)$ (c) $\left(\sqrt{2}, \sqrt{2}\right)$ (d)None of these

**Q.No:19** If $(x, y) - coordinate$ of a point are $(0,-2)$ then the $(r,\theta) - coordinates$ are

(a) $\left(2, \frac{\pi}{2}\right)$ (b) $(-2, \pi)$ (c) $\left(2, \frac{3\pi}{2}\right)$ (d)None of these

**Q.No:20** The polar curve $r = 3\csc\theta$ IS

(a) a circle (b) a line parallel to the line $\theta = \frac{\pi}{2}$

(c) a line parallel to polar axis (d) None of these.

## Full Questions

**Question No: 21** Evaluate the integral $\int \frac{1}{x\sqrt{1+(\ln x)}} dx$. [5]

**Q. No: 22** Use the Simpson's rule to approximate $\int_0^{\pi} \sqrt{\cos x}\ dx$ with n=4.

[5]

**Q.No: 23** Evaluate the integral $\int \frac{x}{(x+3)(x-1)} dx$ . [5]

**Q. No: 24** Let R be the region bounded by the graphs of $y = x^2$ and $y = 1$ . Set up an integral that can be used to find the volume generated by revolving R **about the line y =1**. (Using Disk or washer method)

[5]

**Q. N0: 25** Find the surface area generated by revolving the parametric curve $C : x = t \quad y = t + 1 \quad 0 \le t \le 1$ about the x-axis. [5]

**Q. No: 26** Find the area of the region inside the graph of $r = 4\sin\theta$

[5]