Calculus 2
Final Exam

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MATH

Calculus 2 Final Exam

This exam is comprehensive over the entire course and includes 12 questions. You have 60 minutes to complete the exam.

The exam is worth 100 points. The 8 multiple choice questions are worth 5 points each (40 points total) and the 4 free response questions are worth 15 points each (60 points total).

Mark your multiple choice answers on this cover page. For the free response questions, show your work and make sure to circle your final answer.

1. (5 pts) A B C D E

2. (5 pts) A B C D E

3. (5 pts) A B C D E

4. (5 pts) A B C D E

5. (5 pts) A B C D E

6. (5 pts) A B C D E

7. (5 pts) A B C D E

8. (5 pts) A B C D E

1. **(5 pts)** Evaluate the integral.

$$\int \frac{4x^4 - 2x^2 - 5x}{x^2}\, dx$$

A $\frac{4}{3}x^3 - 2x + 5\ln|x| + C$

B $\frac{4}{3}x^3 - 2x + \frac{5}{x^2} + C$

C $\frac{4}{3}x^3 - 2x - 5\ln|x| + C$

D $\frac{4}{3}x^3 - 2x - \frac{5}{x^2} + C$

E $2x^3 - 2x - 5 + C$

2. **(5 pts)** Evaluate the integral.

$$\int_0^2 (x^2 + 1)\sin(x^3 + 3x)\, dx$$

A $-\frac{1}{3}(1 + \cos(14))$

B $\frac{1}{3}$

C $-\frac{1}{3}\cos(8)$

D $1 - \cos(14)$

E $\frac{1}{3}(1 - \cos(14))$

3. **(5 pts)** Find the average value of the function $f(x) = 8x^3 + 4x$ on the interval $[1,3]$.

A 88

B 82

C 46

D 92

E 44

4. **(5 pts)** Evaluate the trigonometric integral.

$$\int \sin^5(5x)\cos^2(5x)\ dx$$

A $\frac{1}{15}\cos^3(5x) - \frac{2}{25}\cos^5(5x) + \frac{1}{35}\cos^7(5x) + C$

B $-\frac{1}{15}\cos^7(5x) + \frac{2}{25}\cos^5(5x) - \frac{1}{35}\cos^3(5x) + C$

C $\frac{1}{15}\cos^7(5x) - \frac{2}{25}\cos^5(5x) + \frac{1}{35}\cos^3(5x) + C$

D $-\frac{1}{15}\cos^3(5x) + \frac{2}{25}\cos^5(5x) - \frac{1}{35}\cos^7(5x) + C$

E $-\frac{1}{3}\cos^3(5x) + \frac{2}{5}\cos^5(5x) - \frac{1}{7}\cos^7(5x) + C$

5. **(5 pts)** Which series converges?

A $\sum_{n=1}^{\infty} \frac{4^n}{n^2}$

B $\sum_{n=1}^{\infty} \frac{2n}{3n^2+1}$

C $\sum_{n=1}^{\infty} 2 + \frac{1}{n}$

D $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n^5}}$

E $\sum_{n=1}^{\infty} \frac{(n+1)!}{2^n}$

6. **(5 pts)** Find the position function that models the rectilinear motion of a particle moving along the x-axis, if its acceleration is given by $a(t) = 8t - 3$, and if $v(1) = 5$ and $x(0) = 7$.

A $x(t) = \frac{8}{3}t^3 - \frac{3}{2}t^2 + 7$

B $x(t) = \frac{4}{3}t^3 - \frac{3}{2}t^2 + 4t + 7$

C $x(t) = 8t^3 - 3t^2 + 7$

D $x(t) = \frac{8}{3}t^3 - \frac{3}{2}t^2 + 4t + 7$

E $x(t) = \frac{4}{3}t^3 - \frac{3}{2}t^2 + 4t - 7$

7. **(5 pts)** Find the tangent line to the polar curve $r = 5\sin 2\theta$ at $\theta = \pi/4$.

A $y = -x$

C $y = -x + 5\sqrt{2}$

E $y = x - 5\sqrt{2}$

B $y = \dfrac{5\sqrt{2}}{2}$

D $y = x$

8. **(5 pts)** Find the area under one arc of the parametric curve.

$$x = 6 + \sin 2\theta$$

$$y = 2\cos 2\theta$$

A $A = \pi$

C $A = 4\pi$

E $A = 6\pi$

B $A = 2\pi$

D $A = \dfrac{\pi}{2}$

9. **(15 pts)** Using trigonometric substitution, evaluate the integral.

$$\int \frac{x-2}{-x^2+4x-3}\,dx$$

10. **(15 pts)** Use disks to find the volume of the solid formed by rotating the region enclosed by the curves about the x-axis.

$y = x^2 - 2x$ and $y = 0$

$x = 1$ and $x = 4$

11. **(15 pts)** Find the area that lies inside $r = 2 + 2\cos\theta$ and outside $r = 2$.

12. **(15 pts)** Find the radius of convergence of the Maclaurin series.

$$f(x) = \ln(1 + 4x^2)$$