Instructions: Keep all devices capable of communication turned off and out of sight. The exam lasts for 1 hour and 45 min. PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

Multiple Choice(85pts)

Q1 Find the sum of the series $\sum_{n=1}^{+\infty}\left(\frac{e}{\pi}\right)^n$

(A) $\frac{e}{\pi+1}$ (C) π (E) None

(B) $\frac{e}{\pi-e}$ (D) $\frac{\pi}{e-\pi}$

Q2 If $\sum_{n=1}^{\infty}\frac{1}{n^4}=\frac{\pi^4}{90}$, then $\sum_{n=1}^{\infty}\frac{1}{(2n-1)^4}$ is equal to

(A) $\pi^4/96$ (C) $\pi^4/7$ (E) None

(B) $\pi^4/12$ (D) $\pi^2/36$

Q3 Consider the series $\sum_{n=1}^{\infty}\frac{1}{2^n+5n-2}$. Using the comparison test with the series leads to the following result. There is only one correct answer.

(A) The series converges (C) The test is not applicable

(B) The test diverges (D) None

Q4 Suppose f'' is continuous and f and f' have the values given below.

Evaluate $\int_1^3 xf''(x)dx$

	$x=1$	$x=2$	$x=3$
$f(x)$	2	5	8
$f'(x)$	3	1	4

(A) -12 (C) 3 (E) None

(B) 0 (D) 4

Q5 Find the power series for $\ln(1+x)$.

(A) $\sum_{n=1}^{\infty}\frac{(-1)^{n-1}x^n}{n}$ (B) $\sum_{n=1}^{\infty}\frac{(-1)^{n+2}x^n}{n+1}$ (D) $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}x^n}{n}$

(C) $\sum_{n=1}^{\infty}\frac{x^n}{n}$ (E) None

Q6 The length of the curve determined by : $x=\cos^3 t, y=\sin^3 t$ from $t=0$ to $t=\frac{\pi}{2}$ is

(A) 5/3 (C) 3/4 (E) None

(B) 6 (D) 3

Q7 The length of the curve determined by $x=3t$ and $y=2t^2$ from $t=0$ to $t=9$ is

(A) $\int_0^9\sqrt{9t^2+4t^4}dt$ (C) $\int_0^9\sqrt{9t^2+4t^4}dt$ (E) None

(B) $\int_0^9\sqrt{9+16t^2}dt$ (D) $\int_0^9\sqrt{9+16t^4}dt$

Q8 Compute $\int\frac{dx}{x^3-x}$.

(A) $\ln(\frac{\sqrt{x^2+x}}{|x|})+c$ $\frac{1}{3}\ln|x^2+1|+C$ (D) $\ln(\frac{\sqrt{x^2-1}}{|x|})+c$

(B) $2\ln|x|$ + (C) $\frac{1}{2}\ln|x^2+1|+C$ (E) None

Q9 Compute $\int_0^2\sqrt{4-x^2}dx$

(A) $\frac{\pi}{2}$ (C) $2\pi^2$ (E) None

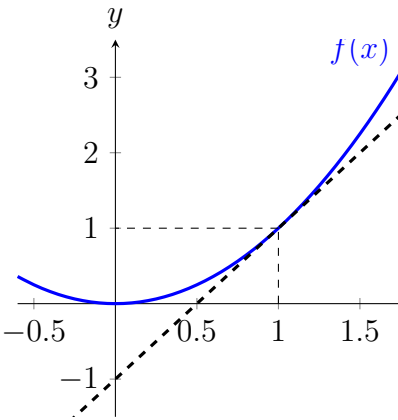
(B) π (D) 4π

Q10 Find the value of the definite integral $\int_0^1 xe^{-x}dx$

(A) $1-2e^{-1}$ (C) $-1+4e^{-1}$ (E) None

(B) $-1+2e^{-1}$ (D) $2e^{-1}$

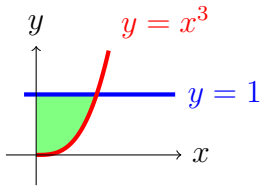
Q11 The graph of the function f is shown right . Find the integral $\int_0^1 f'(x)f''(x)dx$.



(A) -1 (C) 2 (E) None

(B) 1/2 (D) 5/2

Q12 The region bounded by $y = x^3$, $y = 1$ and $x = 0$ is rotated about the y-axis to form a solid.Find the volume of the solid.



(A) $V = 6\pi/7$
(B) $V = 4\pi/7$
(C) $V = 2\pi/7$
(D) $V = 3\pi/5$
(E) None

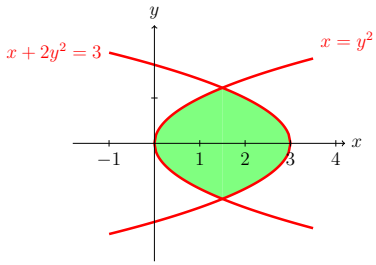
Q13 Compute $\int \frac{1}{3+x^2}\,dx$.

(A) $\frac{1}{6}\tan^{-1}\frac{x}{3} + c$.
(B) $\frac{1}{18}\tan^{-1}\frac{x}{18} + c$.
(C) $\frac{1}{\sqrt{3}}\tan^{-1}\frac{x}{\sqrt{3}} + c$.
(D) $\frac{1}{3}\tan^{-1}\frac{x}{9} + c$.
(E) None

Q14 The integral $\int_0^{\frac{\pi}{2}} \sin^2 x dx$ equals:

(A) $\pi/3$
(B) $\pi/2$
(C) $3\pi/4$
(D) $\pi/4$
(E) None

Q15 Find the area of the region between $x = y^2$ and $x + 2y^2 = 3$.



(A) 4
(B) 5
(C) 9
(D) 11
(E) None

Q16 Find the equation of the plane through $(2, 4, 6)$ that is parallel to the plane $x - y + z = 4$

(A) $x + y - z = 14$
(B) $x - y + z = 4$
(C) $x - y + z = -3$
(D) $2x - y + z = 2$
(E) None

Q17 Find parametric equations for the line passing through the points $P(1, 3, 2)$ and $Q(3, 2, 5)$.

(A) $\frac{x-1}{2} = 3 - y = \frac{z-2}{3}$
(B) $\frac{x-1}{3} = 2 + y = \frac{z-2}{2}$
(C) $\frac{x-1}{4} = 1 - y = \frac{z-1}{3}$
(D) None

True and False(10pts)

Q1(10pts) If the series $\sum_{n=1}^{\infty} a_n$ converges, then the sequence a_n converges to 0.

T F

Q2 The $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is convergent.

T F

Q3 The $\int_1^{\infty} \frac{1}{x^2} dx$ is divergent.

T F

Q4 The intersection of the sphere $x^2 + y^2 + z^2 = 169$ with the plane $z = 14$ is a circle.

T F

Q4 The vectors $\vec{v} = (2, 1, 5)$ and $\vec{w} = (2, 1, -1)$ are perpendicular.

T F

Fill in the blanks(10pts)

Q1 The _____ from the point $P = (x_1, y_1, z_1)$ to the _____ $ax + by + cz + d = 0$ is given by

$$D = \frac{|ax_1 + by_1 + cz_1 + d|}{\sqrt{a^2 + b^2 + c^2}}.$$

Q4 If $||\vec{v}|| = 1$ then $\vec{v}$ is called _____