

Do each of the following problems. Show all your work. No work shown. No credit.

****GOOD LUCK****

1. Evaluate the following integrals: (5 points each)

a. $\int \frac{1}{e^x + 1} dx$

b. $\int \frac{3}{x^2 + 8x + 17} dx$

c. $\int \frac{x^3 - x^2 + 1}{x^2 + x} dx$

d. $\int \frac{x^2 + 9}{x^2 + 1} dx$

e. $\int \frac{dx}{\sqrt{-x^2 + 4x - 3}}$

2. Evaluate the following integrals using trigonometric substitution: (5 points each)

a. $\int \frac{1}{(x^2 + 1)^{3/2}} dx$

b. $\int \frac{dx}{\sqrt{16 - x^2}}$

3. Evaluate the following improper integrals: (5 points each)

a. $\int_0^1 \ln x dx$

b. $\int_2^{\infty} \frac{3x - 1}{x^3 - x^2} dx$

4. Test the following integrals for convergence or divergence. Explain. (5 points each)

a. $\int_1^{\infty} \frac{7}{(x^9 + 9)} dx$

b. $\int_1^{\infty} \frac{1}{(3\sqrt{x} + x^{1/3})} dx$

5. Find the area of the region bounded between the curve $f(x) = x^2 + x$ and the line $g(x) = x + 4$. (5 points)

6. Use the washer method to find the volume of the solid generated by revolving the region bounded by $y = x^2$ and the line $y = 1$ about the line $y = 2$. (5 points)

7. Use Logarithmic differentiation to find the derivative of y with respect to x . (5 points)

$$y = x \frac{\sqrt{x^3 + 1}}{(x-1)^{3/4}}$$

8. Find an equation for the plane through the point (1,2,3) parallel to $\mathbf{u} = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$ and $\mathbf{v} = \mathbf{i} - \mathbf{j} + 2\mathbf{k}$ (5 points)

9. Find the area of a triangle with vertices P(2, -1, 4), Q(1, 0, -1), R(1, 2, 3) (5 points)

10. Find parametric equations for the line through P(1, 2, 5) and Q(-1, 3, 2). (5 points)

11. Find the angle between the planes $3x - y + 2z = 0$ and $x + y + z = 1$ (5 points)

12. Determine the following limit: (5 points)

$$\lim_{x \rightarrow \infty} \left(1 - \frac{1}{2x} \right)^x$$

13. Find the center and radius of the sphere. (5 points)

$$3x^2 + 3y^2 + 3z^2 + 2y - 2z = 9$$