Name ______________________________ Instructor ______________________________

Technical Calculus (I)
Math 210 - Final Exam
December 16, 1998

You must show all relevant work to receive full credit. The point value of each problem is shown in the left hand margin.

(10) 1. Integrate:

$$\int \frac{x-1}{x^2-2x}dx$$

(10) 2. Find the exact area under the curve defined by $y = \frac{1}{x^2}$ between $x = 1$ and $x = 2$.

(10) 3. Evaluate the definite integral.

$$\int_0^6 (1-\sqrt{x})^2 dx$$

(10) 4. The current in a certain wire changes with time according to the relation $I = \sqrt[3]{1+3t}$. How many coulombs of charge pass a specified point in the first $5s$?

(10) 5. Find the area bounded by the curves $y = x^{-2}$, $y = 0$, $x = 2$ and $x = 3$.

(10) 6. Find the volume generated by the area bounded by the curves $y = 2\sqrt{x}$, $x = 0$ and $y = 2$ when rotated about the y-axis.

(10) 7. The gravitational force of attraction between two objects which are x units apart is given by $F = \frac{k}{x^2}$. If the objects are $1cm$ apart, find the work done in separating them to a distance of $2m$ apart. Express the result in terms of k.

(10) 8. Three vertices of a rectangle are (5,2), (-1,2) and (-1,5). What are the coordinates of the fourth vertex?

(10) 9. Determine the value of k, knowing that the distance between $(-1, 5)$ and $(11, k)$ is 20.

(10) 10. Find the equation of the circle with center at $(2, 1)$ and passing through the point $(-4, 1)$.

(10) 11. Find the average rate of change of $y = 2x^2 - 1$ with respect to x from $P(1, -1)$ to $Q(1.1, -1.42)$. Then compare this with the instantaneous rate of change of y with respect to x at P by finding m_{tan} at P.

(10) 12. Find the slope of the tangent line to the curve $y = 2x^6 - 6x^2$ at the point with abscissa $x = 1$.

(10) 13. Find $\frac{dy}{dx}$ by implicit differentiation.

$$xy^3 + 3y + x^3 = 12$$

(10) 14. Find the equation of the tangent line and the normal line to the curve $y = \frac{1}{\sqrt{x^2+1}}$ at the point corresponding to $x = \sqrt{5}$.

(10) 15. Find the differential of the function $y = (1 + 3x)^{\frac{1}{3}}$.

(10) 16. The side of a square is increasing at the rate of $9 ft/min$. How fast is the area changing when the side is $10 ft$ long?