Math 120: Calculus B Name:_____

Exam I Instructor:_____

September 27, 2001 Time of MWF class:_____

Calculators are not allowed. Do not remove this answer page– you will return the whole exam. There are 12 multiple choice questions, worth 5 points each, and 4 partial credit questions worth 10 points each. Record your answers to the multiple choice problems by placing an $\times$ through one letter for each problem on this answer sheet. On problems 13–16, show all necessary work and be sure to mark your answers.

You are taking this exam under the honor code.

The area of the region bounded by the curves $y = -x^3$ and $y = x^2$ is

$\frac{1}{12}$ 2 $\frac{3}{4}$ -3 $-\frac{5}{2}$

The area of the region bounded by $y = 0$, $y = x$, $y = \ln x$ and $y = 2$ is given by which of the following?

$\int_0^2 (e^y - y)\,dy$ $\int_0^4 (y - \ln y)\,dy$ $\int_0^2 (y - \ln y)\,dy$ $\int_0^2 (y - e^y)\,dy$ $\int_0^2 (\ln y - y)dy$

What is the volume of the solid obtained by revolving the region bounded by $x = 1$, $y = x - 1$ and $y = 3$ around the y-axis?

18π 2π 0 9π -3π

Use the method of cylindrical shells (**not the disk method**) to set up an integral which represents the volume of a right circular cone of height 6 and base radius 3.

$2\pi \int_0^3 (6x - 2x^2)\,dx$ $\pi \int_0^6 (3 - \frac{1}{2}y)^2\,dy$ $\pi \int_0^3 (6 - 2x)^2\,dx$ $2\pi \int_0^3 (x^2)\,dx$ $\pi \int_0^6 ((3 - x)x)\,dy$

A spring has a natural length of 80 cm. If a force of 40 N is required to hold it stretched at a length of 90 cm, how much work is done in stretching the spring from its natural length to 130 cm?

50 J 100 J 30 ft-lb 0 J 40 J

Find $\lim_{x \to -\infty} \frac{3e^{2x}}{1 + 2e^{2x}}$

0 1 ∞ $\frac{2}{3}$ $-\infty$

Find the average value of the function $f(x) = e^{3x}$ on the interval $[0, 5]$.

$\frac{1}{15}(e^{15} - 1)$ $\frac{1}{15}e^{15}$ $\frac{1}{3}e^{15}$ $\frac{1}{3}(e^{15} - 1)$ $\frac{1}{5}e^{15}$

Let $f(x) = e^x + 3e^{-x}$. Find $(f^{-1})'(4)$.

$-\frac{1}{2}$ $-\frac{1}{3}$ $\frac{1}{2}$ -2 $\frac{1}{3}$

Find a formula for the inverse function for $f(x) = x^3 - 5$.

$f^{-1}(x) = \sqrt[3]{x + 5}$ $f^{-1}(x) = \sqrt[3]{x - 5}$ $f^{-1}(x) = x + 5$ $f^{-1}(x) = \sqrt[3]{x^3 + 5}$ $f^{-1}(x) = x^3 + 5$

Find the derivative of the function $f(x) = xe^{x^2+1}$.

$e^{x^2+1}(2x^2 + 1)$ e^{x^2+1} $2xe^{x^2+1}$ xe^{x^2+1} $e^{x^2+1}(x + 1)$

Solve for x: $\log_4(\log_3 x) = 1$

$x = 81$ $x = 256$ $x = 3$ $x = 12$ $x = \frac{4}{3}$

Simplify: $\dfrac{\ln 2 + \ln 72 - \ln 9}{\ln 4 \ \ln 5 \ \ln 3 \ \sqrt{10} \ 10}$

13. A tank in the shape of a rectangular box is two-thirds of the way full with water. If it is 3 meters high, 1 meter wide and 5 meters long, how much work is done in emptying the tank out the top? (The density of water is (1000 kg/m^3). **Set up the integral but don't evaluate it.**

14. Sketch the region bounded by the curves $y = e^x$, $y = x + 1$ and $x = 2$. Find the volume of the solid obtained by revolving the region around the x-axis.

15. Find the value of x where the tangent line to the graph of $f(x) = e^{x+1} + e^{-x}$ is horizontal. Hint: $e^{-x} = \dfrac{1}{e^x}$.

16. Let $f(x) = 6 - 3x^2$. Find the value of b for which the average value of $f(x)$ is 2 on the interval $[0, b]$.