136.171 Test #1

Tuesday 8 February 2005 (5:30-6:30 pm) Time: 60 minutes

Name: _____ ID#: _____

INSTRUCTOR (please check one): [ ] BERRY (L01) [ ] MENDELSOHN (L02)

VALUE

[10] 1. Evaluate the integral $\int_0^{\sqrt{8}} x^5\sqrt{x^2+1}\,dx$ (SHOW ALL YOUR WORK)

[4] 2. Set up (BUT DO NOT EVALUATE) integrals to determine the following physical quantities:

(a) The AREA of the region IN THE FIRST QUADRANT enclosed by the curves $x=0$, $y=x^4$ and $y=x^2+20$:

[5] (b) The LENGTH of that portion of the curve given by $y=\ell n(x)$ which lies between the horizontal lines $y=0$ and $y=2$.

Name: _____ ID#: _____

Set up (BUT DO NOT EVALUATE) integrals to determine the following physical quantities (continued):

(c) The VOLUME of the solid of revolution obtained when the disk enclosed by $x^2 + y^2 = 1$ is revolved ABOUT THE LINE $x = 4$, using

[5] (i) the "washers" method :

[6] (ii) the "cylindrical shells" method :

[5] (d) The WORK DONE to lift one end of a chain, lying initially on the ground, and having mass of 50 kg. and a length of 100 m., vertically upward to a height of 30 metres above ground level. [You may ignore friction.]

[5] (e) The TOTAL FLUID FORCE exerted on one face of a rectangular plate, of length 1 m. and height $\frac{1}{2}$ m., when the plate is immersed vertically in water so that its top edge (which is the longer side of the plate) lies $\frac{1}{4}$ m. below the surface of the water.