

# V63.0123-1 : Calculus III. Homework 10

due Wed Apr 23 at lecture.

**17.4:** (useful stuff about a lamina enclosed by a planar curve, using Green's Theorem)

20.

22.

**17.5:** (Curl and div)

1.

2.

12.

15.

30. Remember to first write down clearly what the vector field  $\mathbf{F}(x, y, z)$  is in terms of  $x, y, z$ .

32. [Hint: as above you are using the chain rule repeatedly. You might want to use the intermediate function  $R = r^2$ . There is a value of  $p$ , which you should give.] Extra: how does  $|\mathbf{F}|$  decay with  $r$  at this 'magic' value of  $p$ ? This is a famous law of Newton's.

**17.6:** (Parametric surfaces)

4. Describe the surface, a sketch may help. [Hint: start from problem 3. Take traces by fixing  $x$  and finding what varying  $\theta$  does.]

17. Make sure you understand this simple case!

22. Please write  $\mathbf{r}$  in terms of  $u, v$ . Give the limits of the domain in  $(u, v)$ .

29.

36. [Hint: you can use the regular surface area formula you knew for Midterm2, except you'll need to change your idea of which axis is 'up'. See 16.6.21.]

40. [You may need to look up an integral in back of book].

**17.7:** (Surface integrals—scalar fields only)

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16.