Math 241 Homework 8: §15.1-15.4

1. Evaluate the following integrals. You do not need to simplify horrible expressions.

   (a) $\displaystyle\int_0^1 \int_0^2 xy \, dy \, dx$

   (b) $\displaystyle\int_0^2 \int_0^1 (2x+y)^4 \, dx \, dy$

   (c) $\displaystyle\int_0^1 \int_{x^2}^1 x^3 \, dy \, dx$

   (d) $\displaystyle\int_0^\pi \int_0^\theta r \, dr \, d\theta$

   (e) $\displaystyle\int_0^\pi \int_0^2 \sin\theta \, dr \, d\theta$

2. Evaluate the double integral by first reversing the order of integration.

   (a) $\displaystyle\int_0^1 \int_{\sqrt{y}}^1 \cos(x^3) \, dx \, dy$

   (b) $\displaystyle\int_0^1 \int_{2x}^2 e^{-y^2} \, dy \, dx$

   (c) $\displaystyle\int_0^4 \int_{\sqrt{y}}^2 \frac{3}{x^3+1} \, dx \, dy$

3. Set up bounds to integrate an arbitrary function $f(x,y)$ over the following regions. You do not need to do any actual integration. If you plan on using polar coordinates, make sure to write $r \, dr \, d\theta$ instead of $dx \, dy$ to indicate this.

   (a) The region bounded by $y = 2x$, $y = 4$, and the y-axis.

   (b) The region between $y = x^3$ and $y = x$ in the first quadrant.

   (c) The region bounded by $y = \sqrt{x}$, $x = 4$, and the x-axis.

   (d) The region bounded by the circle of radius 2, the x-axis, and the y-axis.

   (e) The half of the unit circle that lies to the left of the y-axis.

4. Evaluate the following integrals by converting them to polar coordinates.

   (a) $\displaystyle\int_0^3 \int_0^{\sqrt{9-x^2}} \sqrt{25-(x^2+y^2)} \, dy \, dx$

   (b) $\displaystyle\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \sqrt{x^2+y^2} \, dy \, dx$

Extra Problems:

§15.1 1-34 **§15.2** 1-66 **§15.3** 1-18 **§15.4** 1-32