These are only a _few_ sample problems to _help_ you prepare for the exam. You should also be certain that you completely understand the WebWork assignments, Problems Sets, in-class work, and your class notes.

1. You will definitely want to review your techniques of antidifferentiation, including $u$-substitution, integration by parts, and integrals involving the inverse trig functions.

2. Find and classify the critical points of $f(x, y) = 4xy - x^3 - 2y^2$.

3. Let $f(x, y) = 10x^2 y - 5x^2 - 4y^2 - x^4 - 2y^4$. Verify that
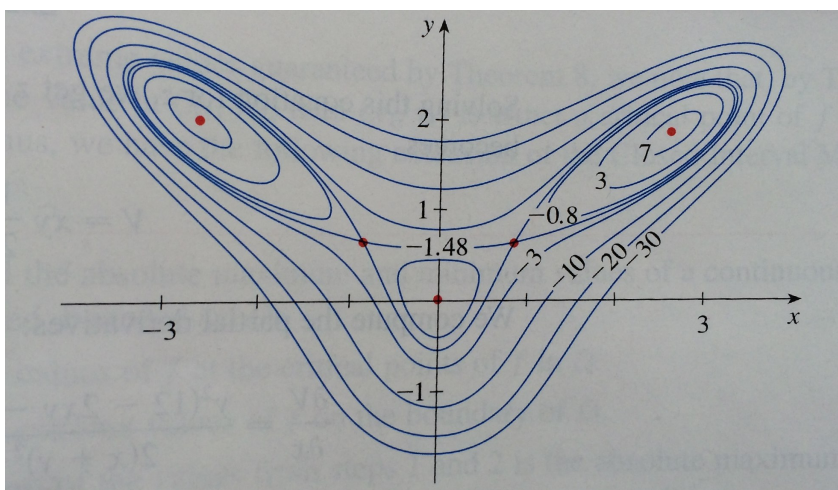
$$p_1 = (0, 0)$$
$$p_2 = (-2.644, 1.898)$$
$$p_3 = (2.644, 1.898)$$
$$p_4 = (-0.856, 0.646)$$
$$p_5 = (0.856, 0.646)$$

   are critical points, and use the contour plot to classify them.



4. Evaluate the following integrals.

   (a) $\displaystyle \int_0^8 \int_{\sqrt[3]{y}}^2 \sin(x^4) \, dx \, dy$

   (b) $\displaystyle \int_0^1 \int_{\sqrt[5]{y}}^1 \cos(x^3) \, dx \, dy$

5. Find the volumes of the solid that lies below the graph $z = y \cos(x^2) + 3$ and above the region in the $xy$-plane bounded by the graphs $x = y^2$ and $x = 9$.

6. Find the point on the surface $z = x^2 + y^2 - 2x - 2y + 2$ that is closest to the origin.