Math 5B: Final Review Answers

2. Global maximum: $\ln(4) - \frac{7}{4}$; global minimum: -1.

3. There are three critical points: $(0,0)$ is a saddle point, and $(0, \pm\sqrt{\ln 4})$ are both local minima.

4. $f(x,y) = 2x^3y + \frac{x^2}{2} - x + z\tan(y) + C$

5. $\frac{\partial}{\partial s} \int_0^t \frac{e^{-s^2(u^2+1)}}{u^2+1}\,du = \int_0^t -2se^{s^2(u^2+1)}\,du$ and $\frac{\partial}{\partial t} \int_0^t \frac{e^{-s^2(u^2+1)}}{u^2+1}\,du = \frac{e^{-s^2(t^2+1)}}{t^2+1}$.

6. After the change of variables, the integral becomes $\int_0^1 \int_{u^2-1}^{1-u^2} \frac{1}{2}u\sqrt[3]{u^2+v}\,dv\,du = \frac{3}{28}$

7. $\frac{(e-1)\ln(\sqrt{2})}{2}$

8. (a) $\int_0^1 \int_1^y \frac{1}{1+y^2}\,dx\,dy = \frac{1}{2}\ln(2) - \frac{\pi}{4}$

   (b) $\int_0^1 \int_y^1 \frac{\sin x}{x}\,dx\,dy = 1 - \cos(1)$

9. Volume: $4\pi\left(\frac{8}{3} - \sqrt{3}\right)$

10. Area: $1 + \frac{\pi}{2}$

11. $\int_0^\pi 3\sqrt{\sin^2(t) + \cos^2(3t)}\,dt$

12. $\oint_C ye^x dx + xdy = \iint_R (1 - e^x)\,dx\,dy = 1 + 3e - e^3$

13. (a) 12π

(b) $4e^2 - 2$

(c) $2e^2 + \frac{5}{9}e^6 - \frac{17}{9}$

(d) 12π