Calculus II, Exam III, Fall 2013

Name:_____

Student signature:_____

Show all your work and give reasons for your answers. Good luck!

(1) **[12 points]** Find the area between the graphs of $f(x) = \sin(x) + 1$ and $g(x) = \cos(x) - 3$ for $0 \leq x \leq 2\pi$.

(2) **[12 points]** Find the volume of the solid of revolution obtained by rotating the region bounded by $f(x) = x^3 + 1$, $g(x) = x^2$ and $0 \leq x \leq 1$ about the line $y = 3$.

(3) **[12 points]** Find the arc length of the graph of $r(t) =< 2t,\ \frac{4}{3}\sqrt{t^3},\ \frac{1}{2}t^2 >$ for $0 \leq t \leq 1$.

(4) **[12 points]** Is the integral $\int_0^\infty \frac{1}{x^4+x^2+x+1}\,dx$ convergent or divergent?

(5) **[12 points]** Evaluate $\int \frac{1}{x^2-9}\,dx$

(6) [**20 points**] Find all the work done in pumping water from a **half full** round spherical container with a radius of $r = 3\,m$ to the top of the spout which is located $5\,m$ above the top of the sphere.

(7) **[20 points]** Find the volume of the solid whose cross sections perpendicular to the x-axis are squares one side of which stretches from the graph of $f(x) = x$ to the graph of $g(x) = x^3$.

(8) **[Bonus 5 points]** Parameterize the curve $r(t) =< 2t,\ \frac{4}{3}\sqrt{t^3},\ \frac{1}{2}t^2 >$ in terms of the arc length variable s. Hint: evaluate

$$s = \int_0^t |r'(u)|\, du$$

and solve for t in terms of s.