MATH 1710 Review sheet. Questions were taken from the final in the Winter 2011 term as well as some made up questions. There is no guarantee the term test this term will in any way resemble this or any other past test.

1. Find $\lim_{x\to 0^+}(1+2x^3)^{1/x^3}$

2. The nose cone of a rocket is obtained by revolving the region enclosed by the curves $y = \ln x$, $y = 0$ and $x = e$ about the x-axis. Calculate the volume of this nose using the cylindrical shells method.

3. The edges of a thin plate with constant mass per unit area ρ are defined by the curves $y = \sin^{-1} x$, $y = 0$ and $x = 1$.

   (a) Find the mass of the plate.

   (b) Find the first moment due to mass of the plate about the x-axis

   (c) Find the first moment due to mass of the plate about the y-axis

   (d) Find the center of mass of the plate

4. Evaluate the integrals

   (a) $\displaystyle\int \csc x \cot^3 x \, dx$

   (b) $\displaystyle\int \frac{\sqrt{x^2-4x-5}}{x-2}\, dx$

   (c) $\displaystyle\int \frac{-x^3+11x^2-x+6}{x^4-3x^2-4}\, dx$

   (d) $\displaystyle\int_{-1}^{0} x^2 \tan^{-1}(1+x^3)\, dx$

5. Sketch the curve $r = 1 + \cos\theta$.

6. Find the length of the curve given in polar coordinates by the equation $r = \theta^2 - 1$, $\pi/2 \leq \theta \leq \pi$.

7. A curve is defined by the parametric equation: $x = t^2 + t$, $y = 2t - 1$, $-1 \leq t \leq 1$.

   (a) Sketch a graph of this curve

   (b) Find the equation of the tangent to this curve corresponding to the point when $t = 0$.

ANSWERS:

1. e^2

2. $\pi(e-2)$

3. The edges of a thin plate with constant mass per unit area ρ are defined by the curves $y = \sin^{-1} x$, $y = 0$ and $x = 1$.

   (a) $\rho(\pi/2 - 1)$

   (b) $\rho(\pi^2/8 - 1)$

   (c) $\rho(\pi/8)$

   (d) $\big(\pi/(4\pi - 8), (\pi^2 - 8)/(4\pi - 8)\big)$

4. Evaluate the integrals

   (a) $\csc x - \csc^3 x/3 + C$

   (b) $\sqrt{x^2 - 4x - 5} + 3\sec^{-1}((x-2)/3) + C$

   (c) $-3\ln|x+2| + 2\ln|x-2| + \tan^{-1} x + C$

   (d) $\pi/12 - (\ln 2)/6$

5.

6. $7\pi^3/24 + \pi/2$

7. A curve is defined by the parametric equation: $x = t^2 + t$, $y = 2t - 1$, $-1 \le t \le 1$.

   (a)

   (b) $y = 2x - 1$