Math 1211: Worksheet #1 **Winter 2016**

Name:	**A#:**	**Section:**

1. $\displaystyle\int \frac{dx}{x \ln x}$

2. $\displaystyle\int \sin 2x \cos^3 2x \, dx$

3. $\displaystyle\int_{-1}^{0} x^5 \sqrt{x^3 + 1}$

4. $\displaystyle\int x \cot x^2 \, dx$

5. $\displaystyle\int \frac{dx}{\sqrt{9-4x^2}}$

6. $\displaystyle\int \frac{x+4}{x^2+4}$

7. $\displaystyle\int x\cos 3x\,dx$ [*Hint:* Integration by parts.]

Math 1211: Worksheet #2 **Winter 2016**

Name:	**A#:**	**Section:**

1. $\int x(\ln x)^2\,dx$

2. $\int x^3 e^{x^2}\,dx$

3. $\int e^{3x}\cos x\,dx$

4. $\int \sin^2 x \cos^3 x \, dx$

5. $\int \sin^2 x \cos^2 x \, dx$

6. $\int \sec^6 x \, dx$

Math 1211: Worksheet #3 **Winter 2016**

Name:	**A#:**	**Section:**

1. $\displaystyle\int \frac{\sqrt{9x^2-1}}{x^2}\,dx$

2. $\displaystyle\int \frac{\sqrt{4-3x^2}}{x}\,dx$

3. $\displaystyle\int \frac{x^3+1}{x^2(x-2)^2}\,dx$

4. $\displaystyle\int \frac{e^x}{e^{2x}-1}dx$ [*Hint:* Try a substitution first.]

Math 1211: Worksheet #4 **Winter 2016**

Name:	**A#:**	**Section:**

1. Decide whether the following improper integrals converge or diverge. If an integral converges, find its value.

   (a) $\displaystyle\int_0^{\pi/2} \tan x \, dx$

   (b) $\displaystyle\int_0^{1} x \ln x \, dx$

   (c) $\displaystyle\int_{-\infty}^{\infty} \frac{dx}{1+4x^2}$

2. (a) Determine $\displaystyle\int \frac{x^2+x}{x^4-16}\,dx$

(b) Use (a) to compute $\displaystyle\int_3^\infty \frac{x^2+x}{x^4-16}\,dx$.

3. Use comparison to decide whether $\displaystyle\int_1^\infty \frac{dx}{\sqrt{x}(x+1)}$ converges or diverges.

Math 1211: Worksheet #5 **Winter 2016**

Name:	**A#:**	**Section:**

1. Find the area between $y = \cos x$ and $y = \cos 2x$ over the interval $0 \leq x \leq \pi$.

2. Find the volume of the solid whose base is the region bounded by $y = x^2$ and $y = \sqrt{x}$, with cross sections perpendicular to the y-axis being semicircles.

3. Let $\mathcal{R}$ be the region bounded between the curves $y^2 = 3 - x$ and $y = x - 1$.

   (a) Sketch $\mathcal{R}$, noting all points of intersection of its bounding curves.

   (b) Give expressions, in terms of definite integrals, for the following.
   Do not evaluate your integrals!

      i. The area of $\mathcal{R}$.

      ii. The volume of the solid obtained by revolving $\mathcal{R}$ about the line $x = -1$.

      iii. The volume of the solid obtained by revolving $\mathcal{R}$ about the line $x = 4$.

      iv. The volume of the solid obtained by revolving $\mathcal{R}$ about the line $y = 2$.

Math 1211: Worksheet #6 **Winter 2016**

Name:	**A#:**	**Section:**

1. Let $\mathcal{R}$ be the region bounded between the curves $y = 4 - x^2$, $y = 3x$ and $x = 0$.

   (a) Sketch $\mathcal{R}$.

   (b) Give expressions, in terms of definite integrals, for the following.
   Do not evaluate your integrals!

      i. The volume of the solid obtained by revolving $\mathcal{R}$ about the y-axis.

      ii. The volume of the solid obtained by revolving $\mathcal{R}$ about the line $x = 3$.

      iii. The volume of the solid obtained by revolving $\mathcal{R}$ about the line $y = -2$.

      iv. The surface area of the solid obtained by revolving $\mathcal{R}$ about the x-axis.

2. Find the length of the curve $y = \ln(\sin x)$ between $x = \pi/4$ and $x = \pi/2$.

3. Consider the parametric curve $\mathcal{C}$ given by $(x, y) = (\cos 2t, \cos t)$ for $0 \leq t \leq 2\pi$.

   (a) Find the Cartesian equation (i.e. $y = f(x)$) form of $\mathcal{C}$.
   Hint: Use a trigonometric identity.

   (b) Use (a) to sketch the curve $\mathcal{C}$. Be sure to indicate the direction of travel.

Math 1211: Worksheet #7 **Winter 2016**

Name:	**A#:**	**Section:**

1. Let $\mathcal{C}$ be the polar curve $r = 2\sin(2\theta)$.

   (a) Sketch $\mathcal{C}$.

   (b) Find a Cartesian equation for $\mathcal{C}$.

   (c) Find the area enclosed by $\mathcal{C}$.

(d) Find the equation of the tangent line to $\mathcal{C}$ at the point $(r, \theta) = (\sqrt{3}, \frac{\pi}{6})$.

(e) Find all points of intersection of $\mathcal{C}$ with the circle $r = 1$.

(f) Give an expression, in terms of definite integrals, for the area enclosed by both $\mathcal{C}$ and the circle $r = 1$. **Do not evaluate.**

Math 1211: Worksheet #8 **Winter 2016**

Name:	**A#:**	**Section:**

1. Find the 4-th order Maclaurin polynomial of $f(x) = \sin x - \cos x$.

2. Find the n-th order Taylor polynomial of $f(x) = \dfrac{1}{(1-2x)^2}$ centred at -1.

3. Recall that the n-th order Maclaurin polynomial of e^x is

$$M_n(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!}.$$

Use this to find the Maclaurin polynomials of the following functions to the given order:

(a) $f(x) = 3e^x + 1$ [order 4]

(b) $g(x) = e^x + e^{-x}$ [order 4]

(c) $h(x) = e^{-x^2}$ [order 8]

(d) $k(x) = x^3 e^{x^2}$ [order 8]

Math 1211: Worksheet #9 **Winter 2016**

Name:	**A#:**	**Section:**

1. Determine whether the following series converge or diverge:

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2+1}{3n^3-\sqrt{n}}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{n+2}{\sqrt{2n^5+n+1}}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{n3^n + 1}{(5n+1)4^n}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n^2}$