MIDTERM I
Math 126, Section C
October 18, 2006

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<th>Problem</th>
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- You may use a scientific calculator and one two-sided sheet of handwritten notes. No other notes, books or calculators are allowed. Please turn off your cell phone.

- Show all your work to get full credit.

- Read instructions for each problem CAREFULLY.

- Leave all your answers in EXACT form.

- Check your work!
1. (15pts) Find the Taylor series for a given function $f(x)$. Give your answer using summation notation.

(a) $f(x) = e^x$, based at $a = 2$

(b) $f(x) = \ln(1 - 2x)$, based at $a = 0$. 

2. (15pts) Let \( f(x) = \frac{1}{(1-x)(1+x)} \).

(a) Find the Taylor series for \( f(x) \) based at \( a = 0 \), and the interval of convergence. Give your answer using the summation notation.

(b) Find the 6th Taylor polynomial of \( f(x) \) based at \( a = 0 \). Simplify your answer as much as possible.

(c) Find \( f^{(6)}(0) \).
3. (15pts) Let \( f(x) = 2\cos^2 x - 1 \).

(a) Find the quadratic approximation \( T_2(x) \) of \( f(x) \) based at \( a = 0 \).

(b) Use the quadratic approximation to estimate \( f(\frac{\pi}{8}) \).

(c) Using Taylor’s inequality, find the error bound for the estimate you computed in (b).
4. (15pts) Let $A = (3, 0, 0)$, $B = (0, 4, 0)$, and $C = (0, 0, 1)$.

(a) Find the area of the triangle $ABC$

*Hint.* The following identity may be useful: $3^2 + 4^2 + 12^2 = 13^2$.

(b) Let $CH$ be the height of the triangle from the vertex $C$ to the base $AB$. Find the coordinates of the point $H$. 