MATH 126 Quiz Oct. 10 Name: KEY

No books, notes or graphing calcuators. Please turn off your cell phones. Show ALL your work.

1. (a) Find the Taylor series for the function $f(x) = \ln(1+x^2)$ based at $a = 0$.

$$\frac{1}{1-x} = \sum x^k$$

$$-\ln(1-x) = \int \frac{1}{1-x} = \int \sum_{k=0}^{\infty} x^k = \sum_{k=0}^{\infty} \int x^k = \sum_{k=0}^{\infty} x^{k+1}/_{k+1} = \sum_{k=1}^{\infty} x^k/_k$$

so $\ln(1-x) = -\sum_{k=1}^{\infty} x^k/_k$

$$\ln(1+x^2) = \ln(1-(-x^2)) = -\sum_{k=1}^{\infty} (-x^2)^k/_k = \boxed{\sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k} x^{2k}}$$

(b) Using quadratic approximation for the function f(x) above, estimate ln(5/4). Leave your answer in exact form.

From a) $\ln(1+x^2) = \frac{x^2}{1} + \frac{-1}{2}x^4 + \ldots$

quadratic approximation is x^2

$\ln(5/4) = \ln(1 + (1/2)^2)$

So use $x = 1/2$

$$\ln(5/4) \approx (1/2)^2 \approx \boxed{1/4}$$