BC 3 Name:________________________________

More approximations

Part 1: Estimating ln(10)

Again, we have $\ln(1 + x) =$ for $(-1, 1]$.

(a) Unfortunately, we can't use this to find ln(10) because of the interval of convergence. However, we can rewrite ln(10) as –ln(1/10). Then we may use the series above for ln (1/10) = ln(1 + *x*) by using *x* = ___. Write out 3 terms of the series and find their sum to approximate –ln(1/10). Also check ln(10) directly on your calculator for comparison.

(b) Here's another approach. Write the series for the following:

<u>interval of convergence</u>

$\ln(1 + x) =$

$\ln(1 - x) =$

$\ln\left(\dfrac{1+x}{1-x}\right) =$

What is the mathematical relationship between the interval of convergence of this last series above and the intervals for the first two?

We still want to find ln(10), so let $\left(\dfrac{1+x}{1-x}\right) = 10$. Find *x*.

Use this value of *x* with 3 terms of the last series above to approximate ln(10).

(c) Which approximation is better? faster?

Part 2 : Estimating $\sqrt{17}$

(a) Find the binomial expansion (the Maclaurin series) for $f(x)=\sqrt{1+x}$.

(b) What is the interval of convergence? (Make a good guess! Graphing would help.)

(c) So what do we do to approximate $\sqrt{17}$?

We write: $\sqrt{17}=\sqrt{16\left(1+\frac{1}{16}\right)}=\sqrt{16}\times\sqrt{1+\frac{1}{16}}=4\sqrt{1+\frac{1}{16}}$.

Now use this with the series above to approximate $\sqrt{17}$.