MATH 222(1,2,4) Fall 2015
Quiz 9 RM Solutions

Please inform your TA if you find any errors in the quiz solutions.

1. (*4 points*)
For each of the following, circle true or false:

$\lim_{n\to\infty} \frac{14n+2+7^n}{100n^7+6n-2} = 0$	True	False
$\lim_{n\to\infty} \sum_{k=1}^{n} \left(\frac{-1}{2}\right)^k$ exists and is finite.	True	False
$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{k}{2^k}$ exists and is finite.	True	False
$\lim_{n\to\infty} \frac{8-15n^2}{n^2-n+6} = 15$	True	False

Solution:

1. False
2. True
3. True
4. False

2. (*6 points*)
Find a bound on $R_n e^x$ which is valid for x satisfying $-2 \le x \le 0$ and use this to show that $e^{-2} = \sum_{k=0}^{\infty} \frac{(-2)^k}{k!}$.
Solution: Set $f(x) = e^x$. Then $f^{(n)}(x) = e^x$ and for $-2 \le x \le 0$, $|f^{(n)}(x)| \le 1$. It follows that

$$\left| e^{-2} - \sum_{k=0}^{n} \frac{(-2)^k}{k!} \right| \le \frac{1}{(n+1)!}$$

As $n \to \infty$, this tends to zero. This shows that

$$e^{-2} = \lim_{n\to\infty} \sum_{k=1}^{n} \frac{(-2)^k}{k!} = \sum_{k=1}^{\infty} \frac{(-2)^k}{k!}.$$