Math 2B: Quiz 6A

Name:
Student ID:

Exercise 1 (4 points)Evaluate the following integrals:
(a)

$$\int \frac{1}{z^2+z}dz$$

(b)

$$\int_1^\infty \frac{1}{z^2+z}dz$$

$$\int \frac{1}{z^2+z}dz = \int \frac{1}{z} - \frac{1}{z+1} = \ln|z| - \ln|z+1| + C$$

So

$$\lim_{h\to\infty}\int_1^h \frac{1}{z^2+z}dz = \lim_{h\to\infty} \ln|h| - \ln|h+1| - \ln|1| + \ln|2|$$

$$\lim_{h\to\infty} \ln|\frac{h}{h+1}| + \ln(2) = \ln(2)$$

Exercise 2(6 points) Determine whether these sequences converge or diverge. Justify your answer.
(a)

$$a_n = \frac{\ln n}{n^2}$$

(b)

$$a_n = \frac{\cos^2(n)\sin^2(n)}{n}$$

(c)

$$a_n = e^{5\pi} + (-1)^n$$

(a) Converges to 0 as using L'Hosptial,

$$\lim_{x\to\infty}\frac{\ln(x)}{x^2} = 0$$

(b) Converges to 0 by Squeeze Theorem

$$0 \le \frac{\cos^2(n)\sin^2(n)}{n} \le \frac{1}{n}$$

and

$$\lim_{n\to\infty} 0 = 0$$

$$\lim_{n\to\infty} \frac{1}{n} = 0$$

(c) Diverges as this sequence oscillates between $e^{5\pi} - 1$ and $e^{5\pi} + 1$.