1. Determine whether the following series is absolutely convergent, conditionally convergent, or divergent:

$$\sum_{n=2}^{\infty} \frac{(-1)^n}{n^2 - n}\,.$$

If this series is convergent, determine its sum.

2. Without using your calculator, compute the cube root of 1.09, with an accuracy of four decimal places.

HINT: You can write the cube root of 1.09 as $(1 + 0.09)^{1/3}$.

3. Consider the function:

$$f(x) = \frac{1}{x^2}\left[\frac{x}{2+x} - \tfrac{1}{2}\ln(1+x)\right]\,.$$

(a) Compute $\lim_{x\to 0} f(x)$.

(b) Find the *behavior* of $f(x)$ as $x \to 0$.

4. Evaluate the following quantities:

(a) $(-1)^i$

(b) $\mathrm{Im}\,[ix + \sqrt{1-x^2}]^{-1}$, where x is a real number and $|x| < 1$

(c) $\arg(e^{x+iy})$, where x and y are real numbers

Be sure to indicate all possible values if the quantity in question is multi-valued. Simplify your expressions as much as possible.

5. Find all complex number solutions z to the following equations:

(a) $z^3 = i$

(b) $e^z = 1 - i$

In both cases, simplify your expressions as much as possible.