Please turn in solutions for the following problems:

(1) Determine whether each series converges or diverges:

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{(2i)^n}$

(b) $\displaystyle\sum_{n=1}^{\infty} e^{in}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{(1+3i)^n}{4^n}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{i^n}{\sqrt{n}}$

(2) For each function, find the Taylor series expansion of the function centered at the specified point:

(a) $f(z) = z\sin(z^2)$ centered at $z = 0$

(b) $f(z) = \dfrac{1}{1-z}$ centered at $z = i$

(3) For each function, find the Laurent series expansion of the function on the specified domain:

(a) $f(z) = \dfrac{e^z - 1}{z^2}$ on the domain $|z| > 0$

(b) $f(z) = \dfrac{\sin(z)}{z^3}$ on the domain $|z| > 0$

(c) $f(z) = \dfrac{z+1}{z-1}$ on the domain $|z| > 1$

(d) $f(z) = e^{1/z^2}$ on the domain $|z| > 0$