For problems 1-4 compute the Taylor series. Assume the series is centered at $x = 0$ unless otherwise specified.

1. $f(x) = \arctan(x^2)$
                                                 2. $f(x) = x\cos(2x)$

3. $f(x) = \sin^2 x$
                                            4. $f(x) = \dfrac{x - \sin x}{x^3}$ when $x \neq 0$, $f(0) = 0$

For problems 5 - 8 compute the first 4 non-zero terms of the Taylor series. Assume the series is centered at $x = 0$ unless otherwise indicated.

5. $f(x) = \sec x$
                                            6. $f(x) = \dfrac{x}{\sin x}$

7. $f(x) = \dfrac{e^x}{x^2 + x + 5}$
                                 8. $f(x) = e^x(\cos x)^2$

For problems 9-12 compute the value of the series using what you know about Taylor series.

9. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \frac{x^{4n}}{n!}$
                                        10. $\displaystyle\sum_{n=0}^{\infty} \frac{3^n}{5^n n!}$

11. $1 - \ln 2 + \dfrac{(\ln 2)^2}{2!} - \dfrac{(\ln 2)^3}{3!} + \cdots$
    12. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{4^{2n+1}(2n+1)!}$