MATH 349
Midterm Handout

1. Determine if the indicated sequence is bounded, ult.monotonic, and convergent

   (a) $a_n = \dfrac{\ell n(n+3)}{n+3}$

2. Determine whether the indicated series is absolutely convergent, conditionally convergent or divergent. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \left(\frac{1}{\sqrt{n}} - \frac{1}{\sqrt{n+1}} \right)$.

3. Find the interval of convergence if $\displaystyle\sum_{k=1}^{\infty} \frac{2^k}{\sqrt{k}} (x-1)^k$.

4. Find the sum of $(a) \displaystyle\sum_{k=1}^{\infty} \frac{(\ell n\, 2)^k}{k!}$ $\quad (b) \displaystyle\sum_{n=3}^{\infty} \frac{(-1)^n}{2^n(n+1)}$.

5. Find the Taylor series for $f(x) = \dfrac{1}{(x+3)x}$ around the center $x_0 = -1$, particularly the coefficient a_6.
   For what values of x is the representation valid?(Hint: Use partial fractions)

6. Find Taylor polynomial of degree 3 for $f(x) = \ln \dfrac{x-1}{x}$ around the centre $x_0 = 2$.

7. Find a parametrization of the curve c given as the intersection of the cone $\{\ z = \sqrt{2x^2 + 2y^2}\}$ and the plane $\{z + x = 1\}$.

8. For the curve c given by $\mathbf{r}(t) = (2t, t^2, \ln t)\,, t > 0$ find

   (a) an equation of the tangent line at $P\,(2, 1, 0)$;
   (b) the arclength of c between P and $R\,(2e, e^2, 1)$.

9. For the curve c given by $\mathbf{r}\,(t) = (t \sin t, t \cos t, 2t)$

   (a) find an equation of the tangent line to c at the origin ;
   (b) find the arclength between the origin and the point $A\left(\frac{\pi}{2}, 0, \pi\right)$.

10. Find a parametrization of the curve c given as the intersection of two surfaces $c = \{x^2 + y^2 = 2z\ \} \cap \{3x - 4y - z = 0\}$.