Practice problems review III

Exercise 1: sequences For each of the following sequences, determine if it converges or not. If it does, find the limit.

(1) $a_n = \dfrac{1+n^2}{(2n+1)(3n+2)}$

(2) $b_n = \sin\left(\dfrac{\pi}{2} + \dfrac{1}{n}\right)$

(3) $c_n = \dfrac{(\frac{-3}{2})^n}{(\frac{4}{5})^n}$

Exercise 2: trig and inverse trig. Evaluate each of the following:

(1) $\frac{d}{dx}(\cos(x))$ at $x = -\frac{\pi}{4}$

(2) $\arccos(\cos(-\frac{\pi}{2}))$

(3) $\frac{d}{dx}(x \arctan(x))$ at $x = -1$

Exercise 3: Limits and continuity of functions. Let $f(x) = \ln(\frac{2x+4}{3x})$. Determine the following:

(1) On what intervals is $f(x)$ continuous?

(2) Find $\lim_{x\to\infty} f(x)$.

(3) Find $f'(x)$. What is the domain of $f'(x)$?

(4) Find $\lim_{x\to\infty} f'(x)$.