Math 172 | Quiz 9 | Name: ______________

29 Mar 2016 | Show Appropriate Work | Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{2}$ Please indicate **T**rue or **F** false.
   (a) **T** / **F** : If $a_n \to 0$ as $n \to \infty$, the series $\sum a_n$ converges.
   (b) **T** / **F** : If $a_n \to 0$ as $n \to \infty$, the series $\sum a_n$ diverges.
   (c) **T** / **F** : If $a_n < b_n$ and $\sum b_n$ converges, then $\sum a_n$ converges.
   (d) **T** / **F** : If $0 < a_n < b_n$ and $\sum b_n$ diverges, then $\sum a_n$ diverges.

2. $\boxed{4}$ For the following series, specify what series you would compare each to (either direct or limit comparison) and based on your comparison, decide if it converges or diverges. No formal justification is needed.

   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{\sqrt{n^2+1}}{n^3+4n}$ compare to $\displaystyle\sum \frac{n}{n^3} = \sum \frac{1}{n^2}$ so it CONVERGES / DIVERGES

   (b) $\displaystyle\sum_{n=2}^{\infty} \frac{3}{2^n\sqrt{n}}$ compare to $\displaystyle\sum \frac{1}{2^n}$ so it CONVERGES / DIVERGES

   (c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n^2+\sqrt{n}}$ compare to $\displaystyle\sum \frac{1}{n^2}$ so it CONVERGES / DIVERGES

   (d) $\displaystyle\sum_{n=2}^{\infty} \frac{\sqrt{n^3+3}}{n^2+n}$ compare to $\displaystyle\sum \frac{1}{\sqrt{n}}$ so it CONVERGES / DIVERGES

3. $\boxed{4}$ Use the Direct Comparison Test to show the following series converges.

$$\sum_{n=4}^{\infty} \frac{n}{n^3+7}$$

Since $0 < \dfrac{n}{n^3+7} < \dfrac{1}{n^2}$

& $\sum \frac{1}{n^2}$ is a convergent p-series $(p = 2 > 1)$

by comparison

$\sum \frac{n}{n^3+7}$ also converges.