Name ____

1) Determine whether the series converges or diverges. Circle which test(s) you use.

[Divergence Test] [Integral Test] [Comparison Test] [Limit Comparison Test] [Ratio Test] [Root Test] [Geometric Series] [p-Series] [Alternating Series]

$$\sum_{k=0}^{\infty} \frac{1}{k^2+1} < \sum_{k=0}^{\infty} \frac{1}{k^2}$$

The larger series is a p series with $p = 2$ and thus converges. Hence $\sum_{k=0}^{\infty} \frac{1}{k^2+1}$ converges as well.

2) Determine whether the series converges or diverges. Circle which test(s) you use.

[Divergence Test] [Integral Test] [Comparison Test] [Limit Comparison Test] [Ratio Test] [Root Test] [Geometric Series] [p-Series] [Alternating Series]

$$\sum_{k=2}^{\infty} \frac{1}{k^2-1}$$

$$\lim_{k\to\infty} \frac{\frac{1}{k^2-1}}{\frac{1}{k^2}} = \lim_{k\to\infty} \frac{k^2}{k^2-1} = 1$$

By the p-series test ($p = 2$), $\sum_{k=2}^{\infty} \frac{1}{k^2}$ converges. By the limit comparison test, $\sum_{k=2}^{\infty} \frac{1}{k^2-1}$, does too because the above limit is 1.

3) Determine whether the series converges or diverges. Circle which test(s) you use.

[Divergence Test] [Integral Test] [Comparison Test] [Limit Comparison Test] [Ratio Test] [Root Test] [Geometric Series] [p-Series] [Alternating Series]

$$\sum_{k=0}^{\infty} \frac{3^k}{k!}$$

$$\lim_{k\to\infty} \frac{\frac{3^{k+1}}{(k+1)!}}{\frac{3^k}{k!}} = \lim_{k\to\infty} \frac{3^{k+1}k!}{(k+1)!\,3^k} = \lim_{k\to\infty} \frac{3}{k+1} = 0 < 1$$

By the ratio test, $\sum_{k=0}^{\infty} \frac{3^k}{k!}$ converges.