

AP Calculus BC - Midterm Review Warm-up #3

Name: Answer Key\*

1) Evaluate the integral:

$$\int \left( \frac{1}{4x-1} - \frac{1}{4x+1} \right) dx$$

$u=4x-1$   
 $du=4dx$

$$\frac{1}{4} \int \frac{4}{4x-1} dx - \frac{1}{4} \int \frac{4}{4x+1} dx$$

$$\frac{1}{4} \int \frac{du}{u} - \frac{1}{4} \int \frac{du}{u}$$

$$\frac{1}{4} \ln|4x-1| - \frac{1}{4} \ln|4x+1| + C$$

2) Evaluate:

$$\frac{1}{2} \int \frac{5}{\sqrt{2x-5}} dx$$

$u=2x-5$   
 $du=2dx$

$$\frac{5}{2} \int \frac{du}{\sqrt{u}} = \frac{5}{2} \int u^{-1/2} du$$

$$\frac{5}{2} \left( \frac{2}{1} u^{1/2} \right) + C$$

$$5\sqrt{2x-5} + C$$

3) Determine whether the integral converges or diverges. If it converges, evaluate the integral.

$$\int_1^{\infty} \frac{1}{x^6} dx$$

$p=6$   
 $p > 1$  converges

$$\frac{1}{p-1} = \frac{1}{6-1} = \frac{1}{5}$$

4) Determine if the sequence converges or diverges.

$$a_n = \frac{5n^2}{n^2+2}$$

$$\lim_{n \rightarrow \infty} \left( \frac{5n^2}{n^2+2} \right) = \boxed{5}$$

converges

5) Determine if the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{4n^3}{n^5}$$

$$\sum_{n=1}^{\infty} \frac{4}{n^2}$$

p-series test  
 $p=2$

converges