

Calculus II. S15 Quiz 6. Name Key Time \_\_\_\_\_  
 Show all work for full or partial credit. Put a box around your final answer in each part.

1. Find the limits, if they exist, and decide "diverges" or "converges."

(a)  $\lim_{n \rightarrow \infty} \frac{e^{2n} + 3n}{5e^{2n} - 6}$

$$= \lim_{x \rightarrow \infty} \frac{e^{2x} + 3x}{5e^{2x} - 6} = \frac{\infty}{\infty}$$

$$= \lim_{x \rightarrow \infty} \frac{2e^{2x} + 3}{5 \cdot 2e^{2x}} = \lim_{x \rightarrow \infty} \frac{4e^{2x}}{5 \cdot 4e^{2x}} = \boxed{\frac{1}{5}} \quad \text{converges}$$

(b)  $\lim_{n \rightarrow \infty} \frac{\cos(2n\pi)}{7}$

$$= \lim_{n \rightarrow \infty} \frac{1}{7} = \boxed{\frac{1}{7}} \quad \text{converges}$$

(c)  $\lim_{n \rightarrow \infty} 3e^n = \lim_{x \rightarrow \infty} 3e^x = \boxed{\infty} \quad \text{diverges}$

2. Decide if the sums converge or diverge, explain why. If there is a formula for the sum, find the value.

(a)  $\sum_{n=1}^{\infty} \frac{e^{2n} + 3n}{5e^{2n} - 6}$

limit test: since  $\lim_{n \rightarrow \infty} a_n = \boxed{\frac{1}{5}} \neq 0$ ,  
 then diverges (to  $\infty$ )

(b)  $\sum_{n=1}^{\infty} \frac{2^n}{3^n}$

$$= \sum_{n=1}^{\infty} \left(\frac{2}{3}\right)^n = \frac{\frac{2}{3}}{1 - \frac{2}{3}} = \frac{\frac{2}{3}}{\frac{1}{3}} = \boxed{2} \quad \checkmark$$

converges:  
 (geometric series)

(c)  $\sum_{n=1}^{\infty} \frac{3}{e^{2n}} = 3 \sum_{n=1}^{\infty} \left(\frac{1}{e^2}\right)^n$

integral test:

$$\int_1^{\infty} \frac{3}{e^{2x}} dx = \lim_{t \rightarrow \infty} \int_1^t 3e^{-2x} dx$$

$$= \lim_{t \rightarrow \infty} \left[ -\frac{3}{2} e^{-2x} \right]_1^t$$

$$= \lim_{t \rightarrow \infty} \left[ -\frac{3}{2} e^{-2t} + \frac{3}{2} e^{-2} \right] = \boxed{\frac{3}{2e^2}}$$

$$\frac{3}{e^2 - 1} = 0.4696 \quad \checkmark$$

converges

so the sum converges

Converges by integral test, but needs geo. formula.