Calculus II Section 9.1 Homework

1) $a_n = 5^n$

a) $a_1 = \underline{\ ?\ }$ b) $a_2 = \underline{\ ?\ }$ c) $a_3 = \underline{\ ?\ }$ d) $a_4 = \underline{\ ?\ }$

2) $a_n = \cos\left(\frac{\pi n}{4}\right)$

a) $a_1 = \underline{\ ?\ }$ b) $a_2 = \underline{\ ?\ }$ c) $a_3 = \underline{\ ?\ }$ d) $a_4 = \underline{\ ?\ }$

3) $a_n = (-1)^n\left(\frac{n}{4}\right)$

a) $a_1 = \underline{\ ?\ }$ b) $a_2 = \underline{\ ?\ }$ c) $a_3 = \underline{\ ?\ }$ d) $a_4 = \underline{\ ?\ }$

4) Recursive Sequence.

$a_1 = 4; \quad a_{n+1} = 2(a_n + 4)$

a) $a_2 = \underline{\ ?\ }$ b) $a_3 = \underline{\ ?\ }$ c) $a_4 = \underline{\ ?\ }$ d) $a_5 = \underline{\ ?\ }$

5) Recursive Sequence.

$a_1 = 2; \quad a_{n+1} = \frac{2}{3}a_n^3$

a) $a_2 = \underline{\ ?\ }$ b) $a_3 = \underline{\ ?\ }$ c) $a_4 = \underline{\ ?\ }$ d) $a_5 = \underline{\ ?\ }$

6) Simplify $\dfrac{(n+2)!}{n!}$

Hint: $n! = (n)(n-1)(n-2)(n-3)(n-4)\cdots(3)(2)(1)$

$(n+2)! = (n+2)(n+1)(n)(n-1)(n-2)(n-3)(n-4)\cdots(3)(2)(1)$

$\dfrac{(n+2)!}{n!} =$? ________________

7) Simplify $\dfrac{(2n+2)!}{(2n-1)!}$

Hint: $(2n+2)! = (2n+2)(2n+1)(2n)(2n-1)(2n-2)(2n-3)\cdots(3)(2)(1)$

$(2n-1)! = (2n-1)(2n-2)(2n-3)(2n-4)(2n-5)\cdots(3)(2)(1)$

$\dfrac{(2n+2)!}{(2n-1)!} =$? ________________

8) Simplify $\dfrac{(2(n+1))!}{(2n)!}$

Hint:

$(2(n+1))! = (2n+2)! = (2n+2)(2n+1)(2n)(2n-1)(2n-2)\cdots(3)(2)(1)$

$(2n)! = (2n)(2n-1)(2n-2)(2n-3)(2n-4)(2n-5)\cdots(3)(2)(1)$

$\dfrac{(2(n+1))!}{(2n)!} =$? ________________

9) Let $a_n = \frac{3n^2}{n^2+2}$

a) Simplify $\frac{3n^2}{n^2+2} = \frac{\left(3n^2\right)/n^2}{\left(n^2+2\right)/n^2} = \underline{\ ?\ \ \ \ \ \ \ }$

b) $\lim_{n\to\infty} a_n = \lim_{n\to\infty} \frac{3n^2}{n^2+2} = \underline{\ ?\ \ \ \ \ \ \ }$

10) Let $a_n = \frac{4n}{\sqrt{4n^2+1}}$

a) Simplify $\frac{4n}{\sqrt{4n^2+1}} = \frac{(4n)/\sqrt{n^2}}{\left(\sqrt{4n^2+1}\right)/\sqrt{n^2}} = \frac{(4n)/n}{\sqrt{\frac{4n^2}{n^2}+\frac{1}{n^2}}} = \underline{\ ?\ \ \ \ \ \ \ }$

b) $\lim_{n\to\infty} a_n = \lim_{n\to\infty} \frac{4n}{\sqrt{4n^2+1}} = \underline{\ ?\ \ \ \ \ \ \ }$

11) Let $a_n = \frac{7n+1}{n}$

a) Simplify $\frac{7n+1}{n} = \frac{(7n+1)/n}{(n)/n} = \underline{\ ?\ \ \ \ \ \ \ }$

b) $\lim_{n\to\infty} a_n = \lim_{n\to\infty} \frac{7n+1}{n} = \underline{\ ?\ \ \ \ \ \ \ }$

12) Let $a_n = \cos\dfrac{n\pi}{2}$

a) $\cos\left(\dfrac{1\pi}{2}\right) = ?$ b) $\cos\left(\dfrac{2\pi}{2}\right) = ?$ c) $\cos\left(\dfrac{3\pi}{2}\right) = ?$ d) $\cos\left(\dfrac{4\pi}{2}\right) = ?$

e) $\cos\left(\dfrac{5\pi}{2}\right) = ?$ f) $\cos\left(\dfrac{6\pi}{2}\right) = ?$ g) $\cos\left(\dfrac{7\pi}{2}\right) = ?$ h) $\cos\left(\dfrac{8\pi}{2}\right) = ?$

i) $\lim\limits_{n\to\infty} a_n = \lim\limits_{n\to\infty} \cos\dfrac{n\pi}{2} = \underline{\ \ ?\ \ \ \ \ \ \ }$

13) Let $a_n = \dfrac{\sqrt[3]{n+1}}{\sqrt[3]{n}}$

a) Simplify $\dfrac{\sqrt[3]{n+1}}{\sqrt[3]{n}} = \dfrac{\sqrt[3]{n+1}/\sqrt[3]{n}}{\sqrt[3]{n}/\sqrt[3]{n}} = \dfrac{\sqrt[3]{n/n+1/n}}{\sqrt[3]{n}/\sqrt[3]{n}} = \underline{\ \ ?\ \ \ \ \ \ \ }$

b) $\lim\limits_{n\to\infty} a_n = \lim\limits_{n\to\infty} \dfrac{\sqrt[3]{n+1}}{\sqrt[3]{n}} = \underline{\ \ ?\ \ \ \ \ \ \ }$

14) Let $a_n = \dfrac{3n^2+5n+7}{5n^2-6}$

a) Simplify $\dfrac{3n^2+5n+7}{5n^2-6} = \dfrac{\left(3n^2+5n+7\right)/n^2}{\left(5n^2-6\right)/n^2} = \underline{\ \ ?\ \ \ \ \ \ \ }$

b) $\lim\limits_{n\to\infty} a_n = \lim\limits_{n\to\infty} \dfrac{3n^2+5n+7}{5n^2-6} = \underline{\ \ ?\ \ \ \ \ \ \ }$

15) Let $a_n = \dfrac{(n+1)!}{n!}$

Hint: $(n+1)! = (n+1)(n)(n-1)(n-2)\cdots(3)(2)(1)$

$n! = (n)(n-1)(n-2)\cdots(3)(2)(1)$

a) Simplify $\dfrac{(n+1)!}{n!} =$ __?_____

b) $\lim\limits_{n\to\infty} a_n = \lim\limits_{n\to\infty} \dfrac{(n+1)!}{n!} =$ __?_____

16) Let $a_n = \dfrac{(n-2)!}{(n+1)!}$

Hint: $(n-2)! = (n-2)(n-3)(n-4)(n-5)\cdots(3)(2)(1)$

$(n+1)! = (n+1)(n)(n-1)(n-2)\cdots(3)(2)(1)$

a) Simplify $\dfrac{(n-2)!}{(n+1)!} =$ __?_____

b) $\lim\limits_{n\to\infty} a_n = \lim\limits_{n\to\infty} \dfrac{(n-2)!}{(n+1)!} =$ __?_____