

Name _____

1. (10 points) Evaluate the following integral.

$$\int \frac{dx}{x^2\sqrt{x^2+4}}$$

2. (10 points) Evaluate the following integral.

$$\int \frac{dx}{x^2-6x+8}$$

3. (10 points) Evaluate the following integral.

$$\int \frac{dx}{x^2 - 6x + 10}$$

4. (10 points) Evaluate the following integral.

$$\int \frac{2x - 5}{x - 3} dx$$

5. (10 points) Evaluate the following integral.

$$\int \frac{2x^2}{(x-1)(x^2+1)} dx$$

6. (10 points) Evaluate the following integral. Use proper notation for each step in your work.

$$\int_3^{\infty} \frac{6}{x^2} dx$$

7. (10 points) Evaluate the following integral. Use proper notation for each step in your work.

$$\int_1^3 \frac{dx}{x-1}$$

8. (10 points) Write out the first five terms of the sequence, determine if the sequence converges, and if so find its limit.

$$\left\{ \frac{\ln k}{k} \right\}_{k=2}^{+\infty}$$

9. (10 points) Show that the given sequence is eventually strictly increasing or eventually strictly decreasing. Which one? You must fully justify your claim and include the value that n needs to exceed for this to occur.

$$\{15n - n^2\}_{n=1}^{+\infty}$$

10. (5 points) Show how to define the sequence below more concisely using curly braces and a general term as in the problem above.

$$\frac{1}{4}, \frac{-1}{9}, \frac{1}{16}, \frac{-1}{25}, \frac{1}{36}, \frac{-1}{49}, \frac{1}{64}, \dots$$

11. (5 points) Consider the sequence $\{a_n\}_{n=1}^{+\infty}$ where

$$\begin{aligned}a_1 &= \sqrt{2} \\a_2 &= \sqrt{2 + \sqrt{2}} \\a_3 &= \sqrt{2 + \sqrt{2 + \sqrt{2}}} \\a_4 &= \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2}}}} \\a_5 &= \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2}}}}} \\&\vdots\end{aligned}$$

(a) Find a recursion formula for a_{n+1} .

(b) Assuming the sequence converges, find its limit.