

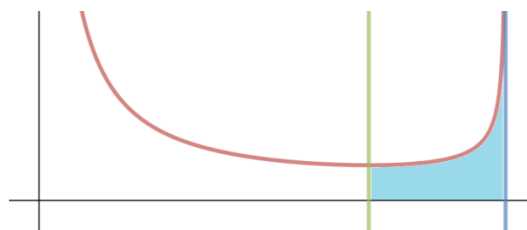
Improper Integral Learning Activity

Name : _____

1. For what values of p is the integral $\int_1^{\infty} \frac{1}{x^p} dx$ convergent? (No computation is necessary if you are 99% confident of your answer).

2. Evaluate $\int_0^{\infty} xe^{-x} dx$. Use integration by parts and limit laws.

3. Find the area of the region enclosed by the graph of $f(x) = \frac{1}{x\sqrt{9-x^2}}$ and the x -axis on the interval $\left[\frac{3\sqrt{2}}{2}, 3\right]$.



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4. Let R be the region bounded by the function $f(x) = \frac{1}{\sqrt{1-x^2}}$ and x -axis on the interval $[0,1]$. Evaluate the area of R .

5. Evaluate $\int_0^1 \frac{\ln x}{\sqrt{x}} dx$.

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6. Evaluate $\int_0^3 \frac{1}{x^2 - 6x + 5} dx$.

7. Evaluate $\int_0^{\frac{\pi}{2}} \sec^4 x dx$.

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8. Evaluate $\int_0^{\infty} \frac{1}{\sqrt{x}(1+x)} dx$.

9. (From Problems B) If $f(t)$ is continuous for $t \geq 0$, the **Laplace Transform** of f is the function F defined by

$$F(s) = \int_0^{\infty} f(t)e^{-st} dt$$

and the domain of F is the set consisting of all numbers s for which the integral converges. Find the **Laplace Transforms** of the following functions.

- $f(t) = 1$
- $f(t) = e^t$
- $f(t) = t$