

NAME : _____

VERIFY ALL ANSWERS WITH A COMPUTING TOOL (like WolframAlpha) when possible.

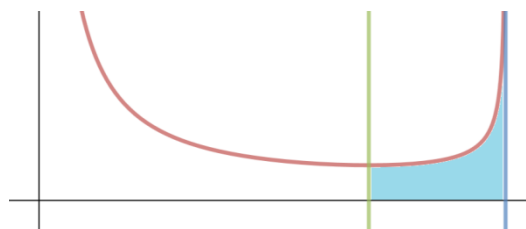
1. For what values of p is $\int_1^{\infty} \frac{1}{x^p} dx$ convergent? You don't need to show work (Hint: see Ex 4 pg 530).

2. For what values of p is the integral $\int_0^1 \frac{1}{x^p} dx$ convergent?

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

4. 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 $\left[\frac{3\sqrt{2}}{2}, 3\right]$.



Improper Integral HW

5. 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 .

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

Improper Integral HW

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

(Hint: Use partial fraction decomposition to write the integrand as the sum of two fractions).

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

Improper Integral HW

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

10. 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 {all numbers s for which the improper integral converges}.

Your task: for each function below, compute its **Laplace Transform** and its domain. (Please use WolframAlpha to check your answer. Type 'Laplace Transform of ...')

a. $f(t) = 1$ (Optional: watch <https://www.khanacademy.org/math/differential-equations/laplace-transform/laplace-transform-tutorial/v/laplace-transform-1>)

Domain of F =

b. $f(t) = e^t$ (Optional: watch <https://www.khanacademy.org/math/differential-equations/laplace-transform/laplace-transform-tutorial/v/laplace-transform-2>)

Domain of F =

c. $f(t) = t$

Domain of F =