

Lab for this assignment will be on Tue Dec 2

1. Find the limit.

$$(a) \lim_{x \rightarrow 0} \frac{6^x - 2^x}{x}$$

$$(b) \lim_{x \rightarrow 0} \frac{\sin mx}{\sin nx}$$

$$(c) \lim_{x \rightarrow \frac{\pi}{2}^-} (\sec 7x \cos 3x)$$

$$(d) \lim_{x \rightarrow 0} \frac{e^{3x} - e^{-3x}}{2x}$$

$$(e) \lim_{x \rightarrow \frac{\pi}{2}} (\tan x - \sec x)$$

$$(f) \lim_{x \rightarrow 0} \frac{\cos mx - \cos nx}{x^2}$$

$$(g) \lim_{x \rightarrow \infty} \frac{\ln^3 x}{x^2}$$

$$(h) \lim_{x \rightarrow \infty} \frac{x^2 + 1}{x \ln x}$$

$$(i) \lim_{x \rightarrow 0^+} \frac{1 - \cos \sqrt{x}}{x}$$

$$(j) \lim_{x \rightarrow \infty} \frac{\ln(1 + e^{2x})}{x}$$

$$(k) \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$$

$$(l) \lim_{t \rightarrow 0} \frac{\ln(\cos 2t)}{t^2}$$

$$(m) \lim_{x \rightarrow 1} \left(\frac{1}{\ln x} - \frac{1}{x - 1} \right)$$

$$(n) \lim_{x \rightarrow \infty} \frac{\ln(x^2 + 1)}{\ln x}$$

$$(o) \lim_{x \rightarrow 0^+} (\sin x)^{\tan x}$$

$$(p) \lim_{x \rightarrow \infty} \left(1 + \frac{a}{x} \right)^{bx}$$

$$(q) \lim_{x \rightarrow \infty} (x + e^x)^{\frac{1}{x}}$$

$$(r) \lim_{x \rightarrow 0} (\cos 3x)^{\frac{5}{x}}$$

2. Evaluate the improper integral or identify it as divergent.

$$(a) \int_2^{\infty} \frac{1}{\sqrt{4x+1}} dx$$

$$(b) \int_0^4 \frac{1}{\sqrt{4-x}} dx$$

$$(c) \int_{-\infty}^0 e^{3x} dx$$

$$(d) \int_1^{\infty} \frac{1}{(x+3)^{\frac{3}{2}}} dx$$

$$(e) \int_0^{\infty} \frac{x}{x^4+1} dx$$

$$(f) \int_{-\infty}^0 \frac{e^x}{1+e^x} dx$$

$$(g) \int_0^3 \frac{1}{\sqrt{9-x^2}} dx$$

$$(h) \int_0^3 \frac{x}{\sqrt{9-x^2}} dx$$

$$(i) \int_e^{\infty} \frac{1}{x \ln^2 x} dx$$

$$(j) \int_{-\infty}^{3/2} \frac{1}{9+4x^2} dx$$

$$(k) \int_{-\infty}^{\infty} \frac{1}{1+9x^2} dx$$

$$(l) \int_0^{\infty} x e^{-x} dx$$

$$(m) \int_1^{\infty} \frac{\ln x}{x \sqrt{x}} dx$$

3. Find volume of the solid of revolution using the shell method. Double check your answer by the Disk/Washer method.

(a) Region bounded by $y = \sqrt{2x-1}$ and $y = 0$, $x = 5$ is revolved about the y-axis.

(b) Region bounded by $y = \sqrt{9-x}$ and $y = 0$, $x = 0$ is revolved about the x-axis.

(c) Region bounded by $y = \sqrt{x}$ and $x + y = 6$, $x = 0$ is revolved about the y-axis.

(d) Region bounded by $x = 4y - y^2$ and $x = y$, $x = 0$ is revolved about the x-axis.

(e) Region bounded by $x = \sqrt{y}$ and $x = 2$, $y = 0$ is revolved about the line $x = 4$.

(f) Region bounded by $x = \sqrt{y}$ and $y = 4$, $x = 0$ is revolved about the line $y = 6$.

(g) Region bounded by $y = 4 - x^2$ and $2x + y = 4$, $y = 0$ is revolved about the line $x = 4$.

(h) Region bounded by $y = \sqrt{x}$ and $y = x/2$, is revolved about the line $y = 2$.