

Name _____ Date _____

NO CALCULATOR!!*Directions: Read each question carefully and show all work.*

Evaluate each of the following limits.

1)
$$\lim_{x \rightarrow 1} \frac{\int_1^x e^{t^2} dx}{x^2 - 1}$$

2)
$$\lim_{x \rightarrow \pi/4} \frac{\sin\left(x - \frac{\pi}{4}\right)}{x - \frac{\pi}{4}}$$

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

4)
$$\lim_{h \rightarrow 0} \frac{\sin\left(\frac{\pi}{4} + h\right) - \sin\frac{\pi}{4}}{h}$$

5)
$$\lim_{x \rightarrow 0} (1 + 6x)^{\csc x}$$

6)
$$\lim_{x \rightarrow 1} \frac{\ln(x^2 + 4x - 4)}{5x^2 - 5}$$

$$7) \lim_{x \rightarrow 0^+} x \ln x$$

$$8) \lim_{t \rightarrow 0^+} \left(\frac{1}{\sin t} - \frac{1}{2t} \right)$$

$$9) \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x} \right)^{3x}$$

$$10) \lim_{x \rightarrow 1} \frac{1 - 1/x}{1 - 1/x^2}$$

Evaluate each of the following integrals and state if they converge or diverge.

$$11) \int_0^{\infty} \frac{x^2}{x^3 + 1} dx$$

$$12) \int_{-\infty}^0 x^2 e^x dx$$

$$13) \int_{-\infty}^{\infty} 4xe^{-4x^2} dx$$

$$14) \int_0^1 \frac{x+1}{\sqrt{x^2+2x}} dx$$

$$15) \int_{-1}^1 \frac{dy}{y^{2/3}}$$

$$16) \int_0^{1/3} \frac{dx}{\sqrt{1-9x^2}}$$

$$17) \int_{-1}^1 \frac{3}{x^2} dx$$

$$18) \int_2^{+\infty} \frac{dx}{x^2}$$

$$19) \int_4^{\infty} \frac{-2x dx}{\sqrt[3]{9-x^2}}$$

Answers:

- 1) $e/2$ 2) 1 3) $1/2$ 4) $\frac{\sqrt{2}}{2}$ 5) e^6 6) $3/5$ 7) 0 8) ∞
9) e^3 10) $1/2$ 11) Diverges 12) Converges to 2 13) Converges to 0
14) Converges to $\sqrt{3}$ 15) Converges to 6 16) Converges to $\frac{\pi}{6}$ 17) Diverges
18) Converges to $1/2$ 19) Diverges