Name: _____

Trigonometric Limits

1) Evaluate the limits

1) $\lim_{x\to\infty} \frac{\sin 2x}{x}$

2) $\lim_{x\to 0} \frac{\sin 5x}{4x}$

3) $\lim_{x\to 0} \frac{\tan x}{x}$

4) $\lim_{x\to 0} \frac{1-\cos x}{\sin x}$

5) $\lim_{x\to 3} \tan \frac{\pi x}{12}$

2) Verify the following limit:

$$\lim_{\varnothing\to 0} \frac{1-\cos\varnothing}{\varnothing^2} = \frac{1}{2}$$

3) Evaluate the limit:

$$\lim_{x\to 0}\left(x^3 + \frac{\sin(9x)}{100000}\right)$$

4) Show that:

1) $\lim\limits_{x\to 0}\dfrac{\sin x\,\cos x}{3x}=\dfrac{1}{3}$

2) $\lim\limits_{x\to 0}\dfrac{\sin 3x}{4x}=\dfrac{3}{4}$

3) $\lim\limits_{x\to 0}\dfrac{1-\cos x}{\sin^2 x}=\dfrac{1}{2}$

4) $\lim\limits_{x\to 0}\dfrac{\tan ax}{\tan bx}=\dfrac{a}{b}$

5) $\lim\limits_{x\to 0}\dfrac{\tan x}{x}=1$

6) $\lim\limits_{x\to 0}\dfrac{\tan 2x-x}{3x-\sin x}=\dfrac{1}{2}$

7) $\lim\limits_{x\to a}\dfrac{\sin x-\sin a}{x-a}=\cos a$

8) $\lim\limits_{x\to 0}\dfrac{\sin 5x-\sin 3x}{\sin x}=2$

9) $\lim\limits_{x\to 0}\dfrac{\sin\left(x/4\right)}{x}=\dfrac{1}{4}$

10) $\lim\limits_{x\to 0}\dfrac{x^2-\tan 2x}{\tan x}=\dfrac{1}{3}$

11) $\lim\limits_{x\to 0}\dfrac{1-\cos 6x}{x}=0$

12) $\lim\limits_{x\to 0}\dfrac{\sin mx}{\tan nx}=\dfrac{m}{n}$

13) $\lim\limits_{x\to 0}\dfrac{1-\cos 2x}{3\tan^2 x}=\dfrac{2}{3}$

14) $\lim\limits_{x\to 0}\dfrac{1-\cos 2x+\tan^2 x}{x\,\sin x}=\dfrac{1}{6}$

15) $\lim\limits_{x\to 0}\dfrac{\tan 3x-2x}{3x-\sin^2 x}=2$

16) $\lim\limits_{x\to 0}\dfrac{1-\tan x}{x-\pi/4}=-2$

17) $\lim\limits_{x\to 0}\dfrac{\tan x/2}{3x}=-2$

18) $\lim\limits_{x\to 0}\dfrac{\cos^2 x}{1-\sin x}=1$

19) $\lim\limits_{h\to 0}\dfrac{\sin(a+h)-\sin a}{h}=\cos(a)$