



## Unit 4B Assignment

Work slowly and carefully. If you are having difficulty, go back and review the appropriate *Lesson*.

As your midterm and final exams do not allow calculators, it is best to attempt all questions in this *Assignment* without a calculator.

Be sure to proofread your assignment carefully.

For full marks, show all calculations, steps, and/or explain your answers.

Total: 80 marks.

1. Evaluate the following limits.

2

a.  $\lim_{\theta \rightarrow 0} \frac{\sin 2\theta}{\theta}$

2

b.  $\lim_{x \rightarrow 0} \frac{\sin 3x}{5x}$

2

c.  $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$

3

d.  $\lim_{x \rightarrow 0} \frac{x - \tan x}{\sin x}$

2

e.  $\lim_{x \rightarrow 0} \frac{\sin 3x}{3x^2 + 6x}$

2. Evaluate the following limits.

3

a.  $\lim_{x \rightarrow 0} \frac{\sin^3 2x}{\sin^3 5x}$

3

b.  $\lim_{x \rightarrow 0} \frac{\cos 2x - \cos^2 x}{\cos x - 1}$

2

c.  $\lim_{x \rightarrow 0} \frac{4 \tan x}{x}$

5

d.  $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$

2

e.  $\lim_{x \rightarrow \frac{5\pi}{3}} \sqrt{\cos x}$

2

f.  $\lim_{x \rightarrow \frac{\pi}{2}} \left(x + \frac{\pi}{2}\right)^2 \sin x$

2

g.  $\lim_{x \rightarrow 0} \left(\frac{x}{1 - \cos x}\right)$

3. Differentiate the following trigonometric functions. Simplify where possible.

2

a.  $f(x) = \sqrt{\cot x + 5x}$

2

b.  $f(x) = \cos(x^2 - 2)^2$

2

c.  $y = \sin^2(\pi x)$

3 d.  $y = \sqrt{\sin \sqrt{x}}$

2 e.  $y = \cos^2(\tan x)$



3

f.  $y = \frac{\tan^5 x}{5} - \frac{\tan^3 x}{3}$

3

g.  $h(x) = 3 \csc x \cos^3 x$

3      h.  $y = \frac{\csc x}{\tan x}$

2      4. Find  $\frac{d^2 y}{dx^2}$  for  $y = \cos 7x$ .

5. Use implicit differentiation to find the derivative of the following relations, with respect to  $x$ . Simplify the derivative as much as possible.

2

a.  $\sin x + \cos 2x = 2xy$

4

b.  $x + y = \cot(x - y)$

- ④ 6. If  $\sin y = \sin(x - y)$ , find  $\frac{dy}{dx}$  at the point  $(\frac{\pi}{2}, \frac{\pi}{4})$ .

- ② 7. Find any possible inflection points for the function  $f(x) = \sin x$  on the interval  $(0, 2\pi)$ .
8. For the function  $f(x) = \sin 2x - 2 \sin x$ , where  $0 \leq x \leq 2\pi$ , find the following information.
- ⑤ a. intervals of increase and decrease

- 4 b. the coordinates of any local extrema

9. For the function  $f(x) = \sin x + \cos x$ , where  $0 \leq x \leq \pi$ , find the following information.

2

a. possible inflection point(s)

2

b. concavity

- ③ 10. Find the equation of the line tangent to the curve  $f(x) = \frac{\sin 2x}{\cos x}$  at the point  $\left(\frac{\pi}{4}, \sqrt{2}\right)$ .