Math 2314 – Calculus I **Homework** Section 2.4 **Name:**

Find the Derivative:

1. $f(x)=x^3\cos x$
2. $f(x)=\sqrt{x}\sin x$
3. $f(x)=\dfrac{\sin x}{x^2}$
4. $f(x)=\dfrac{\cos x}{x^3}$
5. $f(x)=\dfrac{\sin x}{x}$
6. $f(x)=x^2\sin x$
7. $y=\dfrac{3(1-\sin x)}{2\cos x}$
8. $f(x)=-x+\tan x$
9. $g(t)=\sqrt[4]{t}+6\csc t$
10. $y=-\csc x-\sin x$
11. $f(x)=x^2\tan x$
12. $y=2x\sin x+x^2\cos x$
13. $f(\theta)=(\theta+1)\cos\theta$
14. $f(x)=\dfrac{1}{x}-12\sec x$
15. $f(x)=\dfrac{\sec x}{x}$
16. $f(x)=\sin x\cos x$
17. $f(\theta)=5\theta\sec\theta+\theta\tan\theta$
18. $f(x)=\dfrac{\sin x-3x}{x}$
19. $f(x)=\dfrac{\sin x+2x}{x}$
20. $f(\theta)=\dfrac{\sin\theta}{1-\cos\theta}$
21. $f(\theta)=\dfrac{\theta}{1-\sin\theta}$

#1 $f(x) = x^3 \cos x$

$f'(x) = 3x^2 \cos x - x^3 \sin x$

#2 $f(x) = \sqrt{x} \sin x$

$f'(x) = \frac{1}{2\sqrt{x}} \sin x + \sqrt{x} \cos x$

#3 $f(x) = \frac{\sin x}{x^2}$

$f'(x) = \frac{x^2 \cos x - 2x \sin x}{x^4} = \frac{x \cos x - 2 \sin x}{x^3}$

#4 $f(x) = \frac{\cos x}{x^3}$

$f'(x) = \frac{-x^3 \sin x - 3x^2 \cos x}{x^6}$

$= \frac{-x \sin x - 3 \cos x}{x^4}$

#5 $f(x) = \frac{\sin x}{x}$

$f'(x) = \frac{x \cos x - \sin x}{x^2}$

#6 $f(x) = x^2 \sin x$

$f'(x) = 2x \sin x + x^2 \cos x$

#7 $y = \frac{3(1 - \sin x)}{2 \cos x}$

$y' = \frac{3}{2} \cdot \frac{-\cos^2 x - \sin x (1 - \sin x)}{\cos^2 x}$

$= \frac{3}{2} \cdot \frac{\sin^2 x - \cos^2 x - \sin x}{\cos^2 x}$

$= -\frac{3}{2} \cdot \frac{\cos 2x + \sin x}{\cos^2 x}$

#8 $f(x) = -x + \tan x$

$f'(x) = -1 + \sec^2 x$

#9 $g(t) = \sqrt[4]{t} + 6\csc t$

$g'(t) = \frac{1}{4t^{3/4}} - 6\csc t \cot t.$

#10 $y = -\csc x - \sin x$

$y' = \csc x \cot x - \cos x$

#11 $f(x) = x^2 \tan x \rightarrow f'(x) = 2x \tan x + x^2 \sec^2 x$

#12 $y = 2x \sin x + x^2 \cos x$

$y' = 2\sin x + 4x \cos x - x^2 \sin x$

#13 $f(\theta) = (\theta + 1)\cos\theta \rightarrow f'(\theta) = \cos\theta - (\theta+1)\sin\theta$

#14 $f(x) = \frac{1}{x} - 12\sec x \rightarrow f'(x) = \frac{-1}{x^2} - 12\sec x \tan x$

#15 $f(x) = \frac{\sec x}{x} \rightarrow f'(x) = \frac{\sec x(x\tan x - 1)}{x^2}$

#16 $f(x) = \sin x \cos x$ $\quad f'(x) = \cos^2 x - \sin^2 x$

$= \cos 2x$

#17 $f(\theta) = 5\theta \sec\theta + \theta \tan\theta$

$f'(\theta) = 5\sec\theta + 5\theta \sec\theta \tan\theta + \tan\theta + \theta \sec^2\theta.$

#18 $f(x) = \frac{\sin x - 3x}{x}$

$$f'(x) = \frac{x\cos x - 3x - \sin x + 3x}{x^2}$$

$$= \frac{x\cos x - \sin x}{x^2}$$

#19 $f(x) = \frac{\sin x + 2x}{x}$

$$f'(x) = \frac{x\cos x + 2x - \sin x - 2x}{x^2}$$

$$= \frac{x\cos x - \sin x}{x^2}$$

#20 $f(\theta) = \frac{\sin\theta}{1-\cos\theta}$

$$f'(\theta) = \frac{\cos\theta - \cos^2\theta - \sin^2\theta}{(1-\cos\theta)^2}$$

$$= \frac{-1}{1-\cos\theta}$$

#21 $f(\theta) = \frac{\theta}{1-\sin\theta}$

$$f'(\theta) = \frac{1-\sin\theta + \theta\cos\theta}{(1-\sin\theta)^2}$$