MTH 151
Exam 2
Spring 2025

Formula pages are at the end. You may pull them off.

Calculators are allowed. You may use a scientific calculator or a graphing calculator (e.g., TI-84) but not one with CAS (e.g., no TI-89, no TI-Nspire CAS). You may not use a phone app.

Show all work. Be neat and organized. Clearly indicate your answers.

100 points possible.

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0. (2 pts.) 2 free points

1. (24 pts.) Differentiate each function. (You don't have to simplify your answers.)

(a) $f(x) = \dfrac{1}{x^3} + \dfrac{1}{x^{15}}$

(b) $g(x) = \dfrac{12x}{x^9 - x - 4}$

(c) $h(x) = x^5 \sec x$

(d) $y = \dfrac{1}{(10x^2 + 5)^7}$

2. (24 pts.) Find the derivative of the function. (You don't have to simplify your answer.)

(a) $f(x) = \sqrt{\dfrac{x^3}{x^3+9}}$

(b) $g(x) = \cos^3(x^2+1)$

(c) $h(x) = \tan x \sin x$

(d) $y = (9x+4)^5(x^3-4x-1)^8$

3. (10 pts.) Find the exact trigonometric ratios for the angle x whose radian measure is given, or state that the value is undefined.

$x = \dfrac{11\pi}{6}$

(a) $\sin\left(\dfrac{11\pi}{6}\right)$

(b) $\cos\left(\dfrac{11\pi}{6}\right)$

(c) $\tan\left(\dfrac{11\pi}{6}\right)$

(d) $\csc\left(\dfrac{11\pi}{6}\right)$

(e) $\sec\left(\dfrac{11\pi}{6}\right)$

(f) $\cot\left(\dfrac{11\pi}{6}\right)$

4. (10 pts.) Find an equation of the tangent line to the curve at the given point.

$y = \sqrt{9 + x^4}, \qquad (2, 5)$

5. (10 pts.) The differentiable functions f and g are defined for all real numbers x. Values of f, g, f', and g' for various values of x are given in the table.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	5	17	14
2	5	3	15	13
3	1	4	9	12
4	2	1	8	16
5	4	2	20	10

(a) If $h(x) = f(g(x))$, find $h'(4)$.

(b) If $H(x) = g(f(x))$, find $H'(2)$.

6. (10 pts.) Find the second derivative y'' by implicit differentiation. (You don't have to simplify.)

$x^3 + 5y^4 = 30$

7. (10 pts.) The altitude (height) of a triangle is increasing at a rate of 6 ft/min while the area of the triangle is increasing at a rate of 240 ft^2/min. At what rate is the base of the triangle changing when the altitude is 50 ft and the area is 350 ft^2?