

# HOMEWORK 5 - MATH 160

DUE DATE: Tuesday, September 29

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the ten problems will be chosen at random and graded for a total of 20 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the derivative of

(a)  $f(x) = (x^3 + 2x + 1)(2 + \frac{1}{x^2})$

(b)  $f(x) = \frac{x+1}{2x^2+2x+3}$

2. Let  $f(x) = \frac{x}{x^4-2x^2-1}$ . Compute the slope of the tangent line to the graph of  $y = f(x)$  at  $x = -1$ .

3. Find the point(s) on the graph of  $f(x) = (x^2 + 6)(x - 5)$ , where the slope of the tangent line is equal to  $-2$ .

4. Find the derivative of

(a)  $f(x) = \frac{1}{(2x+3)^5}$

(b)  $f(x) = \frac{4}{\sqrt[3]{2x^2+x}}$

5. Find an equation of the tangent line to the graph of  $f(x) = (\frac{x+1}{x-1})^2$  at the point  $(3, 4)$ .

6. In calm waters the oil spilling from the ruptured hull of a grounded tanker spreads in all directions. Assuming that the area polluted is a circle and that its radius is increasing at a rate of 2 feet per second, determine how fast the area is increasing when the radius of the circle is 40 feet.

(**Hint:** The area  $A(t)$  and the radius  $r(t)$  are changing with time and they are related by  $A(t) = \pi r(t)^2$ .)

7. Find the first and the second derivatives of the function  $f(x) = (x^2 + 1)^2(x - 1)$ .

8. Find the third derivative of  $f(x) = (\frac{1}{2}x^2 - 1)^5$ .

9. During the construction of an office building, a hammer is accidentally dropped from a height of 256 feet. The distance (in feet) the hammer falls in  $t$  seconds is  $s(t) = 16t^2$ . What is the hammer's velocity when it strikes the ground?

10. **No tenth problem this week!**