Math 20550 - Summer 2016
Prerequisite Worksheet
June 13, 2016

Problem 1. *Find the derivative of $f(x) = x^2 \cos(x^3 + 3)$.*

Problem 2. *Find $\dfrac{dy}{dx}$ where y is implicitly defined as a function of x by the equation*

$$3(x^2 + y^2)^2 = 100xy.$$

Problem 3. *Find the tangent line to the graph of $3(x^2 + y^2)^2 = 100xy$ at the point $(3, 1)$.*

Problem 4. *Compute the integral*

$$\int \frac{x-3}{x^2-6x+2}dx$$

Problem 5. *Find the antiderivative of* $f(x) = x \cos(x^2)$.

Problem 6. *Describe the region in the first quadrant which is bounded by the circles* $x^2 + y^2 = 2$, $x^2 + y^2 = 4$, $y = x$, *and* $y = 2x$ *using polar coordinates.*

Problem 7. *Compute the integral*

$$\int_0^\pi \sin^3 \theta \, d\theta.$$

Problem 8. *Find the absolute extrema of $f(x) = 2x^3 - 6x$ on the interval $[0, 3]$.*

Problem 9. *State the Second Derivative Test.*

Problem 10. *Find and classify all critical points of the function*
$$f(x) = -3x^5 + 5x^3.$$

Problem 11. *A baseball player running from second base to third base at a speed of 25 feet per second is 20 feet from third base. At what rate is the player's distance s from home plate changing?*
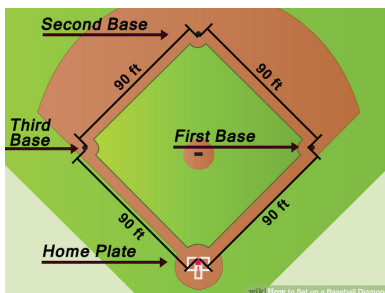
Problem 12. *Find the two positive numbers, where one is the reciprocal of the other, whose sum is as small as possible.*

Problem 13. *Find parametric equations for the ellipse* $\dfrac{x^2}{4} + \dfrac{y^2}{9} = 1.$

Problem 14. *Compute the derivative of* $f(x) = \ln \sqrt[3]{\dfrac{x-1}{x+1}}.$