score	possible	problem
	20	1
	25	2
	25	3
	30	4
	100	

Name: _____
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Work in groups of 3 or 4. Show your work. Aknowledge any help on these specific problems.

/20 1. At which points on the curve $y = 1 + 40x^3 - 3x^5$ does the tangent line have the largest slope?

/25 2. A Norman window has the shape of a rectangle surmounted by a semicircle. (Thus the diameter of the semicircle is equal to the width of the rectangle.) If the perimeter of the window is 30ft, find the dimensions of the window so that the greatest possible amount of light is admitted.

/25 3. A right circular cylinder is inscribed in a cone with height h and base radius r. Find the largest possible volume of such a cylinder.

/10 4. (a) Show that the equation $2x + \cos(x) = 0$ has exactly one real root.

/10 (b) Each side of a square is increasing at a rate of 6 cm/s. At what rate is the area of the square increasing when the area of the square is 16 cm^2?

/10 (c) Use Newton's method with initial guess $x_1 = -3$ to find x_3, the third approximation to the root of the equation

$$\frac{1}{3}x^3 + \frac{1}{2}x^2 + 3 = 0\,.$$