| 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. State

- the definition of "Continuous" and
- the definition of "Differentiable".

Give an example of a function that is one but not the other.

/10 5. State the Intermediate Value Theorem. Then use it to show there is at least one solution to the equation

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

/10 6. Use Newton's method with initial guess $x_1 = -3$ to find $x_3$, the third approximation to the root of the equation

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