

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

Name: _____

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Work in groups of 3 or 4. Show your work. Acknowledge any help on these specific problems.

1. Compute the following derivatives:

/15 (a) $\frac{d}{dx} \sec(x \sin(x^2 + 1)) =$

/15 (b) $\frac{d}{dx} \left(x + \frac{1}{x^3 + 1} \right)^{\sqrt{7}} =$

- /20 2. Use implicit differentiation to find the equation of the tangent line to the curve defined by

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2$$

at the point $(0, 1/2)$.

/10 3. (a) A cylindrical tank with radius 5m is being filled with water at a rate of $3\text{m}^3/\text{min}$. Draw and label a diagram illustrating this scenario. Write the height of the water as a function of time.

/10 (b) A plane flying horizontally at an altitude of 1km and speed of 500km/hr flies directly over a radar station. Draw and label a diagram illustrating this scenario. Write the distance from the plane to the radar station as a function of time.

- /15 4. (a) A man starts running north at 4m/s from a point P . Five minutes later a woman starts running south at 5m/s from a point 500m due east of P . Draw and label a diagram illustrating this scenario. Write the distance between the two people as a function of the time since the woman started running.

- /15 (b) A trough is 10m long and its ends have the shape of isosceles triangles that are 3m across at the top and have a height of 1m . The trough is being filled with water at a rate of $12\text{m}^3/\text{min}$. Draw and label a diagram illustrating this scenario. Write the height of water in the trough as a function of time.