:_____ is *about to rock! And my favorite candy is* _____.
Date: [redacted] Band:_____

Calculus | Packer Collegiate Institute

Implicit Differentiation, Natural Logarithms, and Tangent Lines, Oh My!

Remember to get full credit, you need to show all work, clearly and neatly. Remember, this isn't just about you getting the answer, but you *showing someone else* how you got the answer.

You may use a calculator on this assessment

A. Part I: Prove that if $x = e^y$ (or equivalently, $y = \ln(x)$), then $\frac{dy}{dx} = \frac{1}{x}$

Part II: What is the slope of the tangent line to $y = \ln(x)$ at $x = 3$? If it does not exist, explain why.

Part III: What is the slope of the tangent line to $y = \ln(x^2)$ at $x = -2$? If it does not exist, explain why.

Skill #:
Score:

B. Find the following derivatives:

$y = x^2 \ln(x)$	$y = \ln(5x^2 + 1)$
$y = \ln(\frac{1}{x^2})$	$y = \ln(\ln(x))$
$y = \ln(3)$	Skill #: Score:

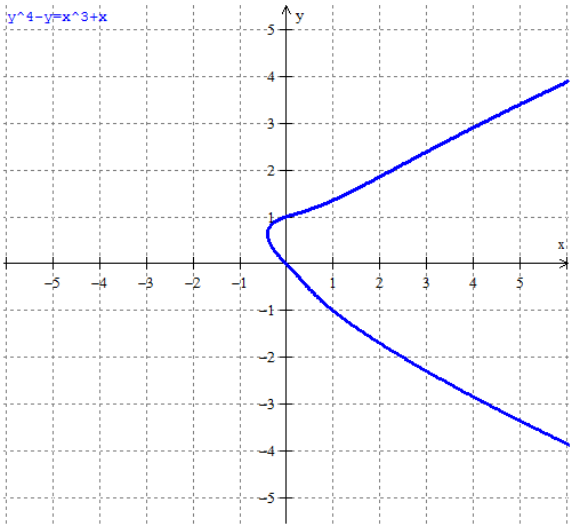
C. Part I: What is/are the equation(s) of the tangent line(s) of $x^2 + y^2 = 25$ at $x = 3$?

Part II: What is/are the equation(s) of the tangent line(s) of $y^2 - x = x^3 + y$ at $x = 1$?

Skill #:
Score:

D. The relation $y^4 - y = x^3 + x$, when graphed is below. And we calculated the derivative as:

$$y' = \frac{3x^2 + 1}{4y^3 - 1}$$



(a) Using the **equation** for the derivative, show that there are *no* points where the tangent line is horizontal. Explain how you know this.

(b) Using any method you can, find two points on the original relation $y^4 - y = x^3 + x$.

Point A: _____ Point B:_____

(c) The slope of the tangent line at Point A is: _____

The slope of the tangent line at Point B is: _____

(d) The equation for the tangent line at Point A: _____

The equation of the tangent line at Point B: _____

(e) Looking at the graph above, find where the tangent line is vertical. Put a dot there.

(f) Using the equation for the derivative, find the *y*- coordinate of the point where the tangent line is vertical.

(g) Using any method you can, can you find the *x*- coordinate of the point where the tangent line is vertical? (Hint: Your calculator is a great friend!)

Skill #:
Score:

E. Use implicit differentiation to find y':

Part I: $x^4 + y^4 = 5$

Part II: $\cos(y) + y = 5x^2$

Part III: $xy^2 = 5\sin(x) + y^2$

Part IV: $xe^y + x^3 = \sin(x^2)$

Skill #:
Score:

INTEGRITY STATEMENT:

On my personal integrity, I have not given, nor received, nor witnessed any unauthorized assistance on this exam.

_____

(signature)

If you can't sign this in good conscience, please don't. Come speak to me.