Recitation Time_____ PRINT your name _____

Math 141, Exam 3, Spring 2009

The exam is worth a total of 50 points. There are 10 questions on 5 pages. Each problem is worth 5 points. **SHOW your work. Make your work be coherent and clear.** Write in complete sentences whenever this is possible. $\boxed{CIRCLE}$ your answer. **CHECK** your answer whenever possible. **No Calculators.**

I will post the solutions on my website on Monday, March 9.

1. Let $y = \sin(\sqrt{2x^2 + \pi x})$. Find $\frac{dy}{dx}$.

2. Let $y = \ln(\sin(4x))$. Find $\frac{dy}{dx}$.

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3. Let $4x^2y^3 + 9\cos y = 10x$. Find $\frac{dy}{dx}$.

4. Find the equation of the line tangent to $f(x) = x^{10} + 2x$ at $x = 1$.

5. Parameterize the curve pictured below. Use t as your parameter with $0 \le t \le 2$. The point that corresponds to $t = 0$ is $(-1, 0)$. The point that corresponds to $t = 1$ is $(0, 2)$. The point that corresponds to $t = 2$ is $(1, 0)$. (Note: Each part of the curve that **looks** like a line segment **is** a line segment.)
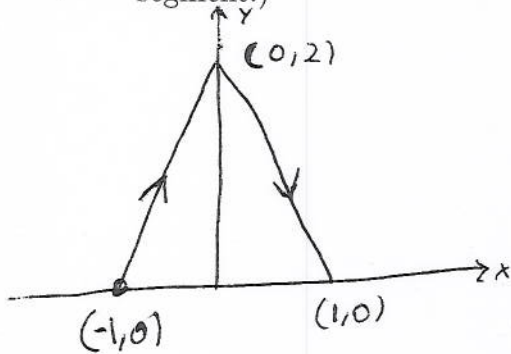
6. The height of an object above the ground is given by $y(t) = -16t^2 + 32t + 48$, where y is measured in feet and t is measured in seconds. Find the velocity of the object when it hits the ground. **Be sure to give units.**

7. Compute $\lim\limits_{x \to \infty} \left(1 - \frac{2}{x}\right)^{3x}$.

8. Let $f(x) = \sin(x)$. Use the **DEFINITION OF THE DERIVATIVE** to find $f'(x)$.

9. Each side of a square is growing at the rate of 2 in/sec. How fast is the area of the square growing when each side has length 10 inches? **Be sure to give units.**

10. A man 6 feet tall is walking away from an 18 foot tall street light at the rate of 3 ft/sec. At what rate is his shadow lengthening? **Be sure to give units.**