Seven pages, seven questions, 75 points total.

Some problem-solving hints:

1. Don't panic.
2. If you're stuck, at least try *something*.
3. If you can't do something, don't.
4. If things gets weird, there's probably a mistake.
5. If you can't solve a problem, solve an easier problem first.
6. When in doubt, write it out.
7. Remember: $(a + b)^2 \neq a^2 + b^2$.
8. If a method doesn't help, admit it.

**Problem 1** (5 points each)**.** *Compute the following derivatives, but don't simplify:*

(a) $\dfrac{d}{dx}\dfrac{7x^3 + 2x - 7}{2x + 1}$

(b) $\dfrac{d}{dx}\sin^2 x$

(c) $\dfrac{d}{dx}(2x)^x$

**Problem 2** (10 points)*. Find the equation for the tangent line to the curve $x^2 + y^2 = 25$ at the point $(3, 4)$.*

**Problem 3** (10 points). *Use linear approximation to estimate the value of*

$$e^{0.03}$$

**Problem 4** (10 points)**.** *You are inflating a spherical balloon at a rate of* $100cm^3/s$. *How fast is its radius changing when the volume is* $1000cm^3$? *(Hint:* $\frac{4}{3}\pi r^3$ *might be relevant).*

**Problem 5** (10 points). *Compute the limit*

$$\lim_{x \to \infty} \frac{x}{e^x + 2}$$

**Problem 6** (10 points). *Suppose you drove from Urbana to Chicago (139 miles) in three hours. The speed limit is 65 miles/hour. Did you go over the speed limit? Explain.*

**Problem 7** (10 points). *A farmer wants to fence an area of 1.5 million square feet in a rectangular field and then divide it in half with a fence parallel to one fo the sides of the rectangle. How can he do this so as to minimize the cost of the fence?*