1. Find the equation of the tangent line to the curve \( y = 3x^2 - 2x + 7 \) at the point \((3, 28)\).
(Do not use any shortcuts.)

2. The following graph depicts the position of two racers.

(a) Which racer has a faster average speed? When was each racer running faster than the other (approximately)? Which racer was running the fastest at the end of the race?

(b) On a separate plot from this picture, sketch the graphs of the velocities of these racers.

(c) Suppose that the distance (from the starting point) of the red racer is given by the function \( p_r(t) \) and the distance of the blue racer is given by \( p_b(t) \). When you have completed (a) and (b), ask me for these functions. Use this new information (and your knowledge of derivatives) to check whether your answers in (a) and (b) were accurate.

3. Find the derivative \( f'(x) \) for the following functions.

(a) \( f(x) = (2x^2 + 4)(x^7 + 3x) \)

(b) \( f(x) = 7^{23} \)

(c) \( f(x) = \frac{2x - 7}{3x + 9} \)

4. Where is the function \( h(x) = |x-1| + |x+2| \) differentiable? Give a (piecewise) function for the derivative.
5. Find the derivative $\frac{dy}{dx}$ for the following functions.

(a) $y = 3x^2 + 2$

(b) $y = \frac{x}{x^2 + 2x - 1}$

6. Let

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 2 \\ mx + b & \text{if } x > 2 \end{cases}.$$ 

Find values of $m$ and $b$ making $f$ differentiable everywhere.

7. What is the relationship between a function $f(x)$ being differentiable at a real number $a$ and being continuous at $a$? In particular, is there a function $f(x)$ and a real number $a$ such that $f(x)$ is continuous at $a$ and not differentiable at $a$? What about a function $f(x)$ and a real number $a$ such that $f(x)$ is differentiable at $a$ and not continuous at $a$? If the answer is yes, provide such an example.

8. If a politician declares, “We have reduced the rate by which the national debt is rising,” and $d(t)$ denotes the debt of the nation with respect to time $t$, which derivative of $d$ is being reduced? What can you conclude about the size of $d(t)$ itself? Sketch some possible graphs of $d(t)$.