

Show all of your work on the quiz paper. Full credit is not given unless the answer follows from the work shown.

1. (5 points) Find the derivative of the function and write your answer with no negative exponents.

$$f(x) = \sqrt{x^3 - 5x + 1} = (x^3 - 5x + 1)^{1/2}$$

$$f'(x) = \frac{1}{2}(x^3 - 5x + 1)^{-1/2}(3x^2 - 5)$$

$$= \frac{3x^2 - 5}{2(x^3 - 5x + 1)^{1/2}} \text{ or } \frac{3x^2 - 5}{2\sqrt{x^3 - 5x + 1}}$$

2. (8 points) Given that  $y = \frac{1}{2t+3}$ , find each of the following and write each answer with no negative exponents.

(a)  $\frac{dy}{dt}$

$$y = \frac{1}{2t+3} = (2t+3)^{-1}$$

$$\frac{dy}{dt} = -(2t+3)^{-2}(2) = -2(2t+3)^{-2} = \frac{-2}{(2t+3)^2}$$

(b)  $\frac{d^2y}{dt^2}$

$$\frac{dy}{dt} = -2(2t+3)^{-2}$$

$$\frac{d^2y}{dt^2} = 4(2t+3)^{-3}(2) = 8(2t+3)^{-3} = \frac{8}{(2t+3)^3}$$

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3. (6 points) Find the x-coordinates of any point or points on the graph of the function  $f(x) = x^3 + 6x^2 - 30x + 7$  at which the tangent line has slope 6.

$$f'(x) = 3x^2 + 12x - 30 = 6$$

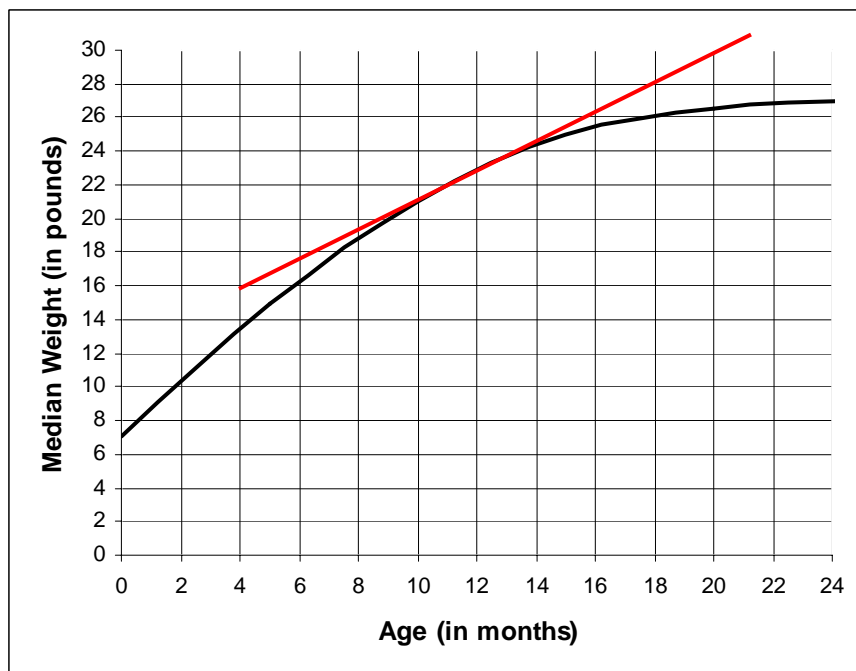
$$3x^2 + 12x - 36 = 0$$

$$3(x^2 + 4x - 12) = 0$$

$$3(x+6)(x-2) = 0$$

$$x = -6, \quad x = 2$$

4. (6 points) The median weight of baby boys at age  $x$  months is shown in the graph below. Use the graph to answer each question.



- (a) What was the average growth rate of a baby boy during his first year of life? Use appropriate units in your answer.

Use the points  $(0, 7)$  and  $(12, 23)$ .

$$m = \frac{23-7}{12-0} = \frac{16}{12} = \frac{4}{3} \approx 1.3 \text{ pounds / month}$$

- (b) What was the growth rate of a baby boy at age one year? Use appropriate units in your answer.

Draw in a tangent line at  $(12, 23)$ . The slope of this line can be calculated by using the points  $(12, 23)$  and  $(20, 30)$ . The slope is approximately

$$\frac{30-23}{20-12} = \frac{7}{8} = .875 \approx .9 \text{ pounds / month}$$

Other answers are possible, but they should be close to the answer given.