

Question 1: Derive the function which goes through two points, (2, 8) and (-4, 5).

$$b = \frac{5-8}{-4-2} = \frac{-3}{-6} = \frac{1}{2} \quad] \quad (5)$$

$$(y-8) = \frac{1}{2}(x-2) \Rightarrow y = \frac{1}{2}x - 1 + 8 = \frac{1}{2}x + 7 \quad (5)$$

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Question 2. For $f(x) = 2x^3 - 3x^2 - 11x + 6$, answer the following questions.

(a) Apply Rational Root Theorem and find all the candidate roots and one actual root.

(20) $a \in \{ \pm 1, \pm 2, \pm 3, \pm 6 \}$

$b \in \{ \pm 1, \pm 2 \}$

(19) $\frac{a}{b} = \{ \pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2} \}$ ← all the candidates for roots

(8/19) $f(-2) = -16 - 12 + 22 + 6 = 0$ -2 is one of the roots

(b) Apply Quadratic Deviation and Quadratic Formula to find other roots.

(20) $(2x^3 - 3x^2 - 11x + 6) \div (x+2) = \frac{2x^3 - 7x^2 + 3}{4} \rightarrow X = \frac{7 \pm \sqrt{49 - 4(2)(3)}}{4}$

$$= \frac{7 \pm \sqrt{49 - 24}}{4}$$

$$= \frac{7 \pm \sqrt{25}}{4} = \frac{7 \pm 5}{4} = \frac{1}{2}, 3 \quad (10)$$

(c) By calculating the first derivative of $f(x)$ and setting = 0 (and apply the quadratic formula), find the (x,y) coordinates for the peak/bottom of the concave/convex function.

(20) $f'(x) = 6x^2 - 6x - 11 = 0$

$$x = \frac{6 \pm \sqrt{36 - 4(6)(-11)}}{12}$$

$$= \frac{6 \pm \sqrt{36 + 264}}{12}$$

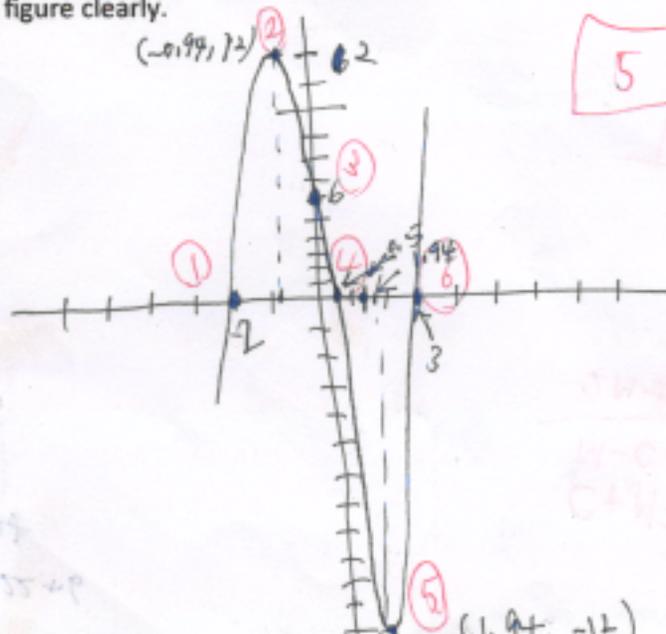
$$= \frac{6 \pm \sqrt{300}}{12} = \frac{6 \pm 17.32}{12} = 1.94, -0.94 \quad (10)$$

$f(1.94) = -12$

$f(-0.94) = 12$ (1.94, -12)

$(-0.94, 12)$

(d) Draw this function by identifying (i) y-intercept, (ii) roots, (iii) (local) max/min (answers from part (c)) points in the figure clearly.



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(1.94, -12)