

①  $x$   $y=f(x)$

(5pts)

-2	1
0	7
1	10

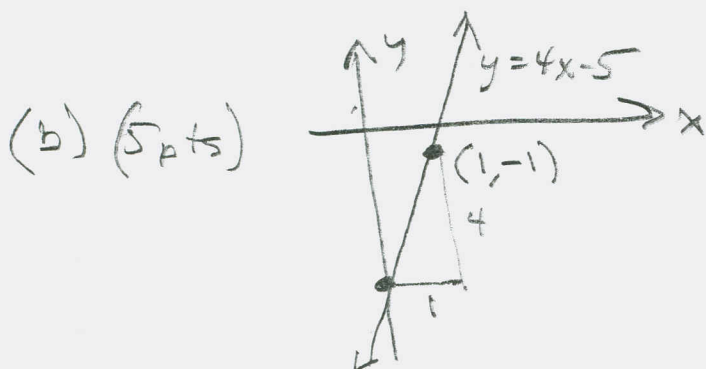
$$m_1 = \frac{7-1}{0-(-2)} = \frac{6}{2} = 3$$

$$m_2 = \frac{10-7}{1-0} = 3$$

Yes. Linear Function

②  $f(x) = 4x - 5$

(a) (5pts)  $m = 4 = \text{slope}$   $b = -5 \rightarrow (0, -5)$  is y-intercept



(5pts) (c) Average rate of change is  $m = 4$

(d) (5pts)  $f$  is increasing

③  $y$  varies jointly as square of  $x$  & cube of  $z$ .

$$y = kx^2z^3, \quad y = 27 \text{ when } x = 2, z = 3.$$

$$27 = k(2)^2(3)^3 = 108k$$

$$108k = 27$$

$$k = \frac{27}{108} = \frac{1}{4}$$

$$\therefore y = \frac{1}{4}x^2z^3$$

when  $x = 3$  &  $z = -1$ ,

$$y = \frac{1}{4}(3)^2(-1)^3$$

$$y = -\frac{9}{4}$$

(4)  $f(x) = 12x^2 - 7x - 10$

(a)  $(12)(-10) = -120$  MAGIC!

(5pts)  $-7 = 1 - 8 \quad -8$   
 $= 10 - 17 \quad -170$   
 $= 5 - 12 \quad -60$   
 $= 8 - 15 \quad -120 \checkmark$

$12x^2 + 8x - 15x - 10$   
 $= 4x(3x+2) - 5(3x+2)$   
 $= (3x+2)(4x-5) \stackrel{\text{SET}}{=} 0$

$\Rightarrow x \in \left\{ -\frac{2}{3}, \frac{5}{4} \right\}$

(b)  $a = 12, b = -7, c = -10$

$b^2 - 4ac = (-7)^2 - 4(12)(-10)$

(5pts)  $= 49 + 480$   
 $= 529$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{7 \pm \sqrt{529}}{2(12)}$

$= \frac{7 \pm 23}{24}$   
 $\begin{matrix} \nearrow \frac{30}{24} = \frac{5}{4} \\ \searrow \frac{-16}{24} = -\frac{2}{3} \end{matrix}$

$x \in \left\{ -\frac{2}{3}, \frac{5}{4} \right\}$

(c) (5pts)

$f(x) = 2x^2 - 3x - 5 \stackrel{\text{SET}}{=} 0$

$f(x) = 2\left(x^2 - \frac{3}{2}x - \frac{5}{2}\right) = 0$

$x^2 - \frac{3}{2}x - \frac{5}{2} = 0$

$x^2 - \frac{3}{2}x = \frac{5}{2}$

$x^2 - \frac{3}{2}x + \left(\frac{3}{4}\right)^2 = \frac{5}{2} + \frac{9}{16}$

$\left(x - \frac{3}{4}\right)^2 = \frac{49}{16}$

$x - \frac{3}{4} = \pm \sqrt{\frac{49}{16}} = \pm \frac{7}{4}$

$x = \frac{3 \pm 7}{4}$   
 $\begin{matrix} \nearrow \frac{10}{4} = \frac{5}{2} \\ \searrow \frac{-4}{4} = -1 \end{matrix}$

$x \in \left\{ -1, \frac{5}{2} \right\}$

$$(5) f(x) = (x-3)^2 - 7$$

$$(a) (5 \text{ pts}) (x-3)^2 - 7 \stackrel{\text{SET}}{=} 0$$

$$(x-3)^2 = 7$$

$$x-3 = \pm \sqrt{7}$$

$$x = 3 \pm \sqrt{7}$$

$$\longrightarrow x \in \{3 - \sqrt{7}, 3 + \sqrt{7}\}$$

(b) (5 pts) x-intercepts of f are

$$(3 - \sqrt{7}, 0), (3 + \sqrt{7}, 0)$$

$$(6) \text{ Graph } f(x) = x^2 - 6x - 11 \quad (10 \text{ pts})$$

$$x^2 - 6x - 11$$

$$= x^2 - 6x + 3^2 - 9 - 11$$

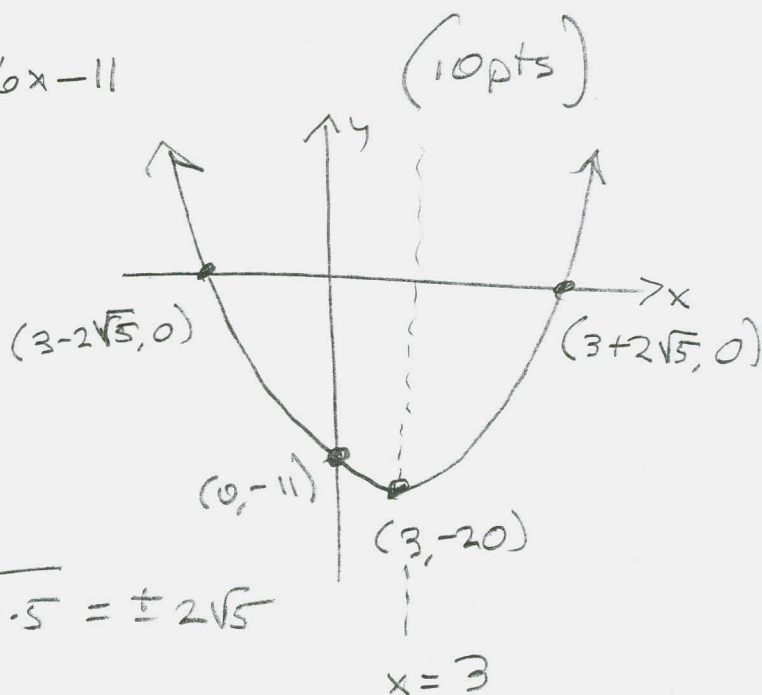
$$= (x-3)^2 - 20$$

$$\text{SET} = 0 \longrightarrow$$

$$(x-3)^2 = 20$$

$$x-3 = \pm \sqrt{20} = \pm \sqrt{4 \cdot 5} = \pm 2\sqrt{5}$$

$$x = 3 \pm 2\sqrt{5}$$



$$D = (-\infty, \infty)$$

$$Inc = (3, \infty)$$

$$R = [-20, \infty)$$

$$Dec = (-\infty, 3)$$

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(7)  $f(x) = 5x^2 - 6x + 3$

(a) (5 pts)  $a = 5, b = -6, c = 3$

$$\begin{aligned} \Rightarrow b^2 - 4ac &= (-6)^2 - 4(5)(3) \\ &= 36 - 60 = \boxed{-24} \end{aligned}$$

(b) (5 pts) (a)  $\Rightarrow$  f has two distinct nonreal zeros

(8) (10 pts)  $f(x) = x^2 - 5x + 11$

SET = 0  $\Rightarrow$

$$x^2 - 5x + 11 = 0$$

$$x^2 - 5x = -11$$

$$x^2 - 5x + \left(\frac{5}{2}\right)^2 = -11 + \frac{25}{4}$$

$$\left(x - \frac{5}{2}\right)^2 = \frac{25 - 44}{4} = -\frac{19}{4}$$

$$x - \frac{5}{2} = \pm i \sqrt{\frac{19}{4}} = \pm i \frac{\sqrt{19}}{\sqrt{4}} = \pm \frac{i\sqrt{19}}{2}$$

$$x = \frac{5 \pm i\sqrt{19}}{2}$$

$$x \in \left\{ \frac{5}{2} - \frac{\sqrt{19}}{2}i, \frac{5}{2} + \frac{\sqrt{19}}{2}i \right\}$$

(9) (10 pts)

$$x^2 \leq 14 - 5x$$

$$x^2 + 5x - 14 < 0$$

$$(x+7)(x-2) < 0$$

