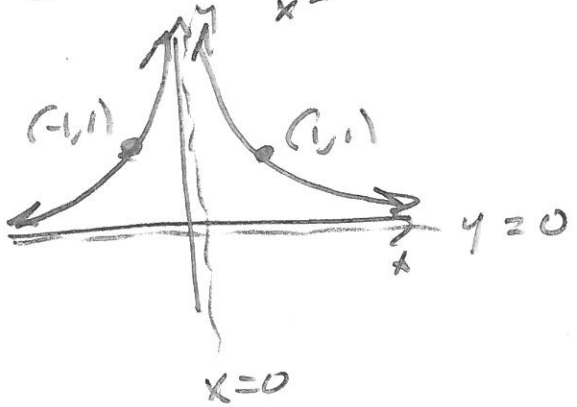
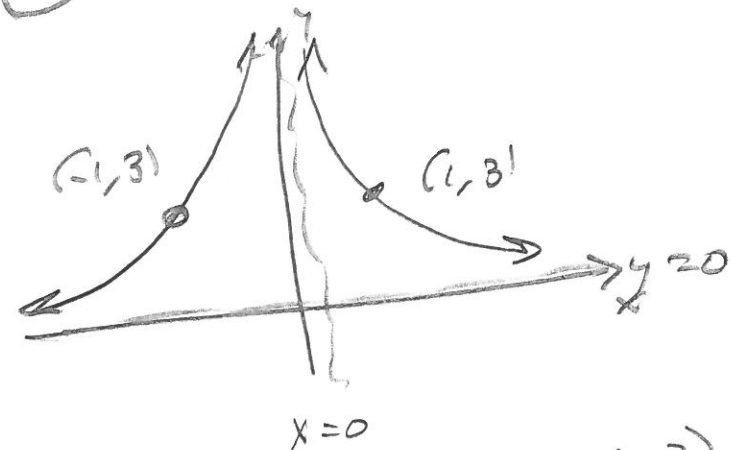
121 Writing Project #2 Fall 2019

① $g(x) = \frac{3}{(5x-15)^2} - 6$ $\quad g(0) = \frac{3}{15^2} - 6 < 0$

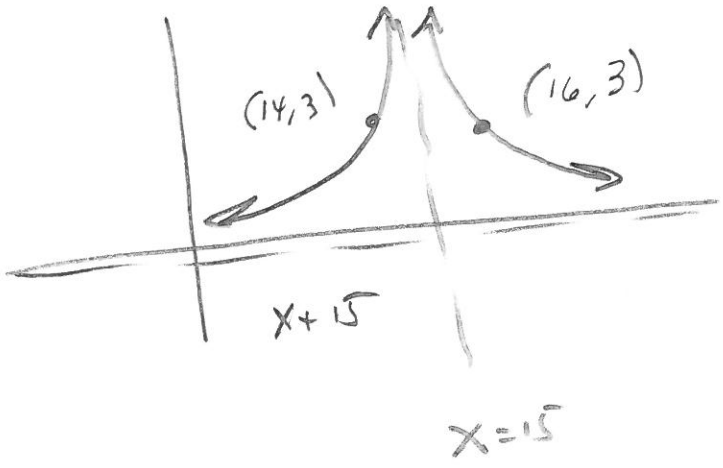
⓪ $f(x) = \frac{1}{x^2}$



① $3f(x) = \frac{3}{x^2}$

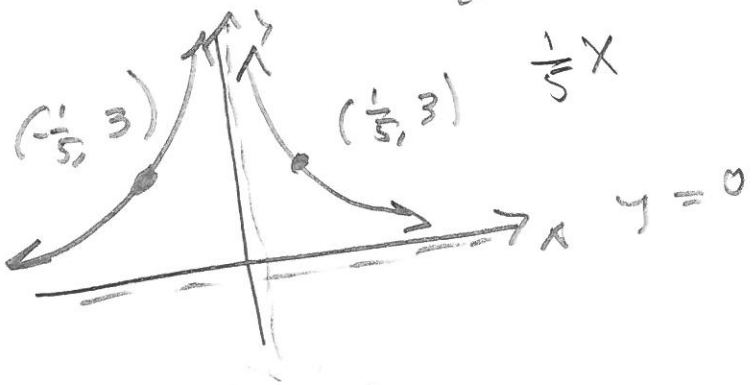


② (M1) $3f(x-15) = \frac{3}{(x-15)^2}$



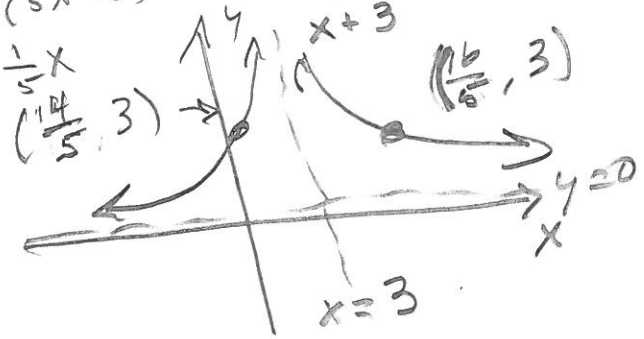
② (M2) $5x-15 = 5(x-3)$

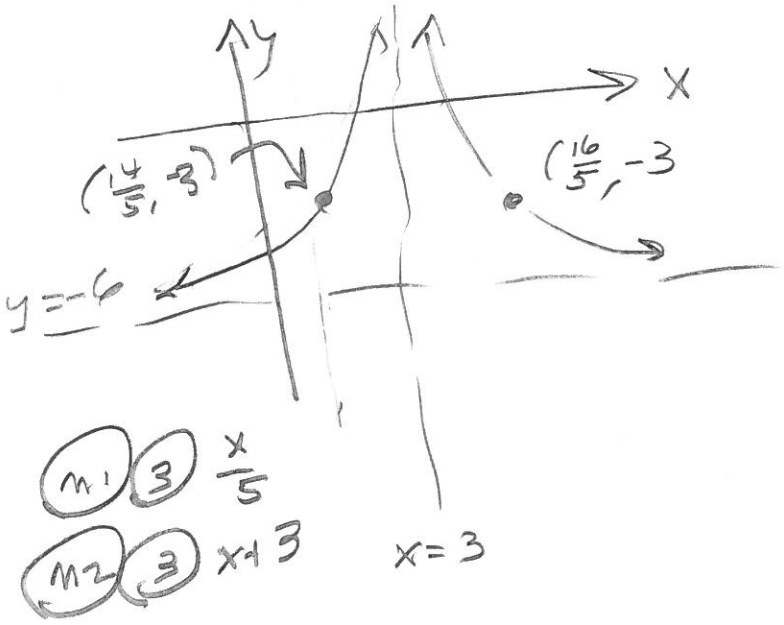
$3f(5x) = \frac{3}{(5x)^2}$



③ $3f(5x-15) = 3f(5(x-3))$

$= \frac{3}{(5x-15)^2} = \frac{3}{(5(x-3))^2}$





(M1) (3) $\frac{x}{5}$

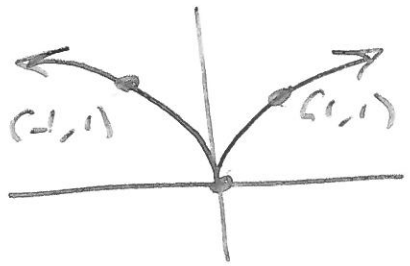
(M2) (3) $x+3$

121 WP #2 Fall '19

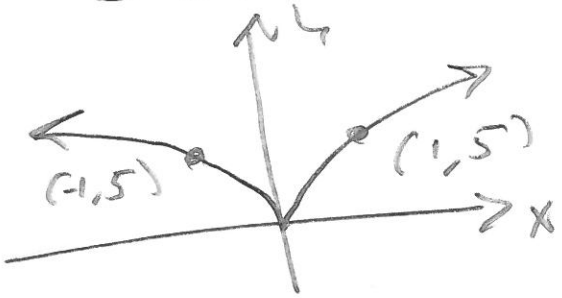
(2) $g(x) = 5(2x-14)^{2/3} + 4$ $\quad g(0) = 5(-\frac{14}{1})^{2/3} + 4 > 0$

(To see where axes fit in final graph.)

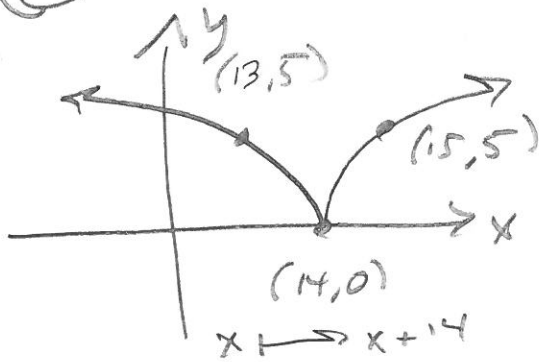
(0) $f(x) = x^{2/3}$



(1) $5f(x) = 5x^{2/3}$

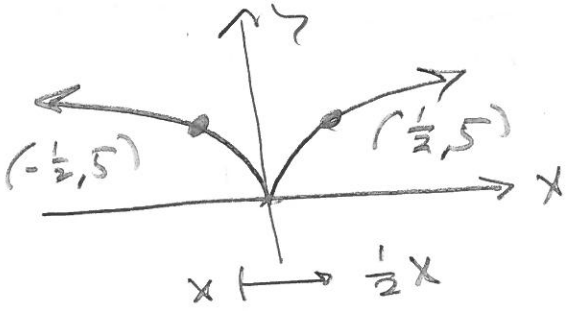


(2) (M1) $5f(x-14) = 5(x-14)^{2/3}$



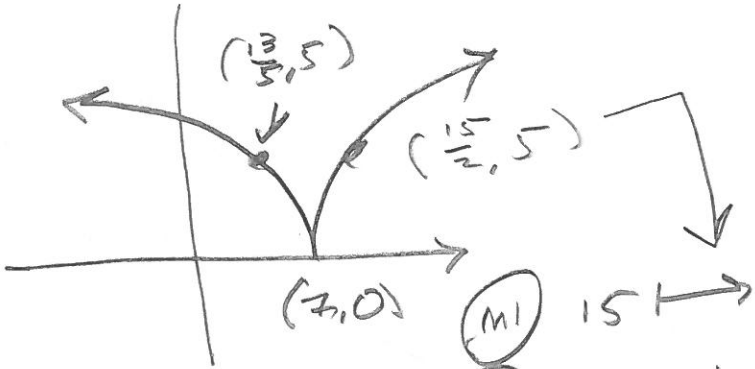
(M2) $2x-14 = 2(x-7)$

(2) $5f(2x) = 5(2x)^{2/3}$



(3) (M1) $x \longmapsto \frac{1}{2}x$ $\quad 5(2x-14)^{2/3}$

(M2) $x \longmapsto x+7$

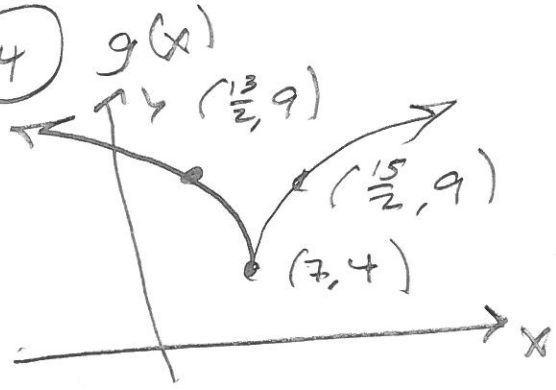


(M1) $15 \longmapsto \frac{15}{2}$

(M2) $\frac{1}{2} \longmapsto \frac{1}{2} + 7$

$= \frac{1+14}{2} = \frac{15}{2}$

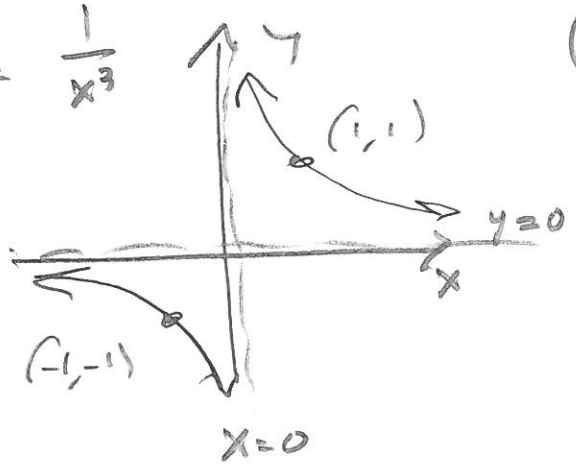
(4) $g(x)$



121 WP #2 FALL '19

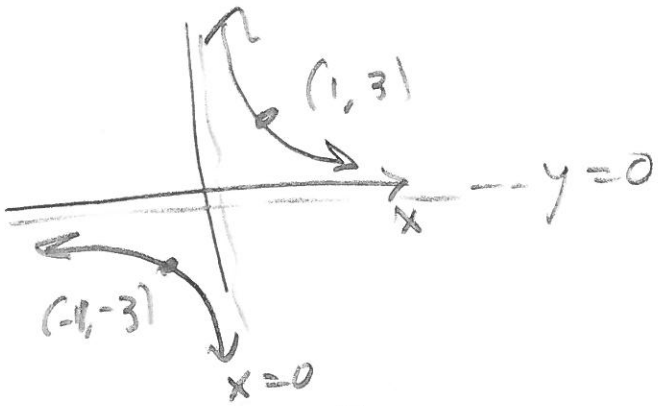
(3) $g(x) = \dfrac{3}{(5x-15)^3} - 6$ $g(0) < 0$

(0) $f(x) = \dfrac{1}{x^3}$



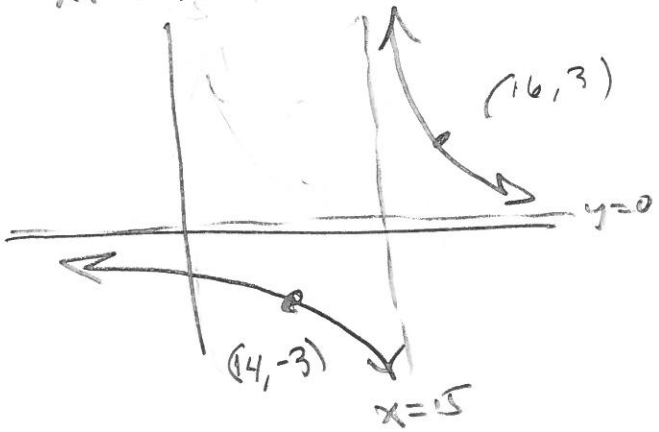
(1) $3f(x) = \dfrac{3}{x^3}$

$y \mapsto 3y$



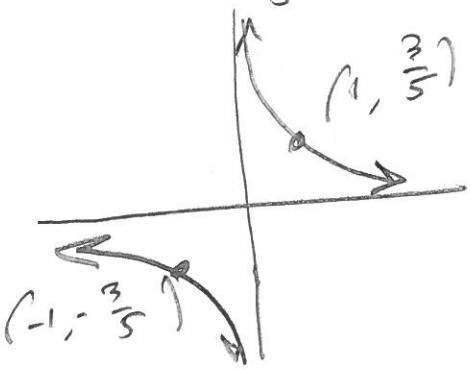
(3 M1) $3f(x-15) = \dfrac{3}{(x-15)^3}$

$x \mapsto x+15$



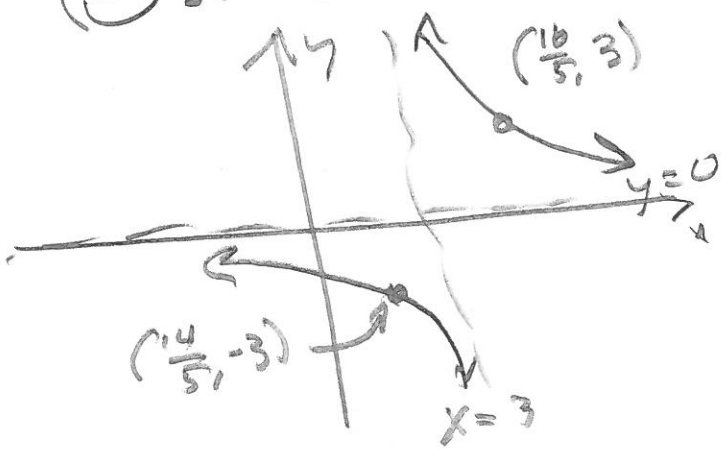
(2 M2) $3f(5x) = \dfrac{3}{(5x)^3}$

$x \mapsto \frac{1}{5}x$

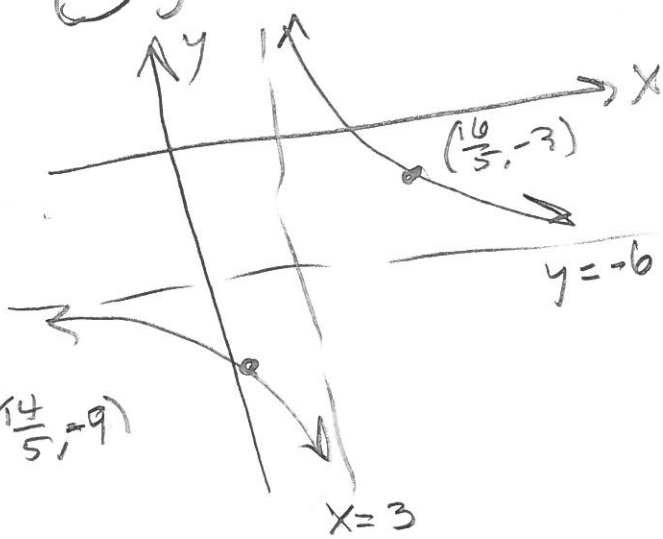


(3) (M1) $3f(5x-15)$ $x \mapsto \frac{1}{5}x$

(M2) $3f(5(x-3))$ $x \mapsto x+3$



(Y) $g(x)$ DOWN 6 from #3

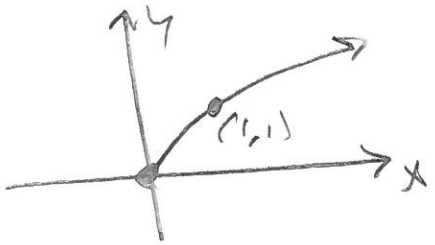


121 WP #2 Fall '19

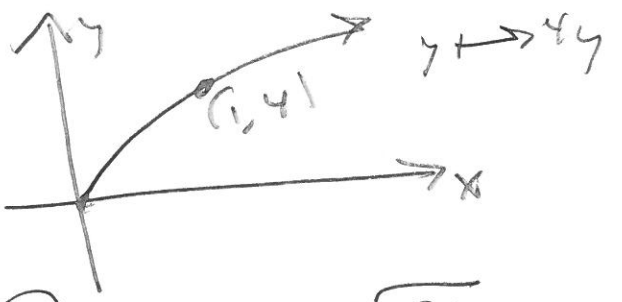
(4) $g(x) = 4\sqrt{5x+30} - 11 = 4\sqrt{5(x+6)} - 11$
m1 m2

$g(0) > 0$

(0) $f(x) = \sqrt{x}$

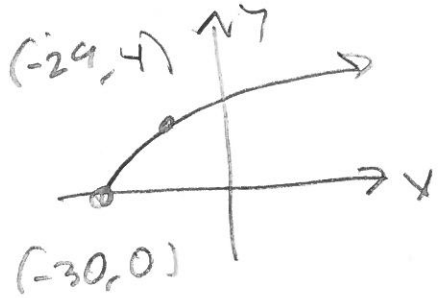


(1) $4f(x) = 4\sqrt{x}$



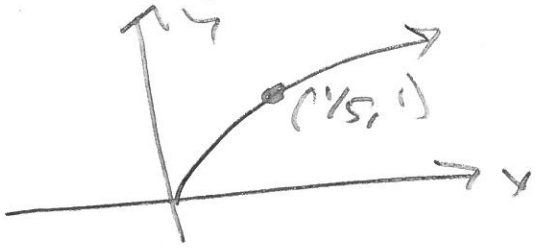
(2m1) $4f(x+30) = 4\sqrt{x+30}$

$x \longmapsto x-30$



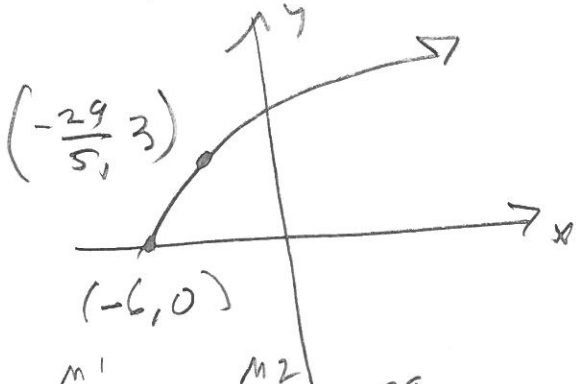
(2m2) $4f(5x) = 4\sqrt{5x}$

$x \longmapsto \frac{1}{5}x$



(3) $4f(5x+30) = 4f(5(x+6))$
m2

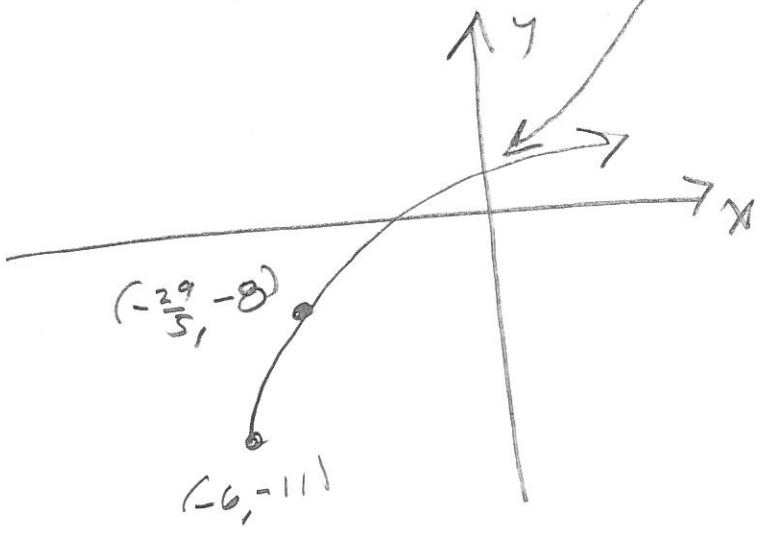
m1: $x \longmapsto \frac{1}{5}x$ $\quad x \longmapsto x-6$



m1 m2

$-\frac{29}{5}$, $\frac{1}{5}-6 = -\frac{29}{5}$

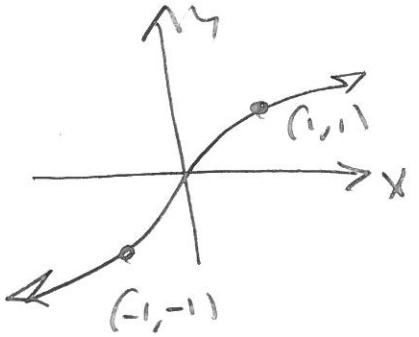
(4) $g(x)$ $\quad y \longmapsto y-11$



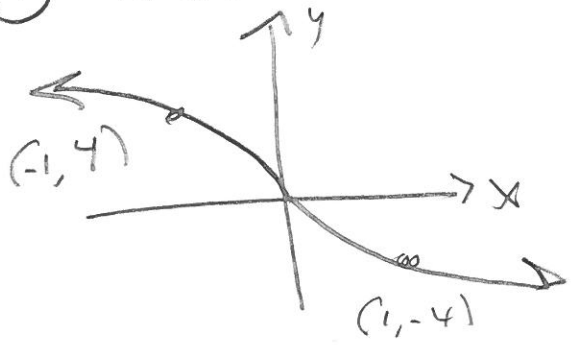
121 WP #2 FALL '19

(5) $g(x) = -4\sqrt[3]{5x+30} - 11$

(0) $f(x) = \sqrt[3]{x}$

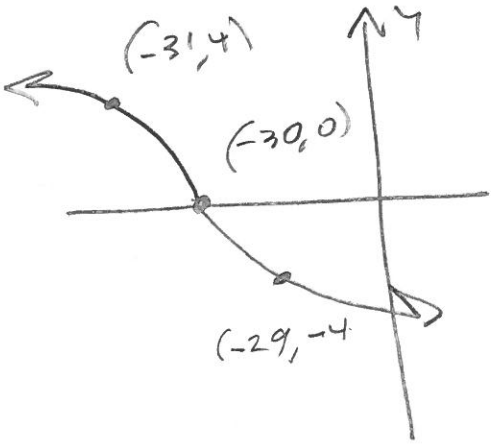


(1) $-4f(x) = -4\sqrt[3]{x}$ $\quad y \longmapsto -4y$



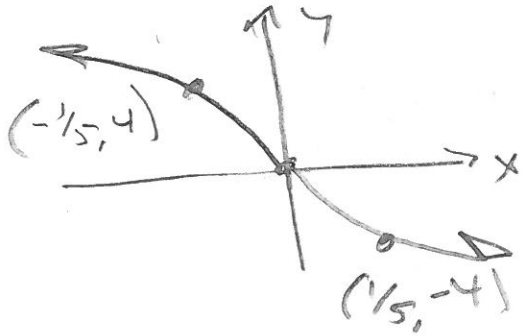
(2M1) $-4f(x+30)$

$x \longmapsto x-30$



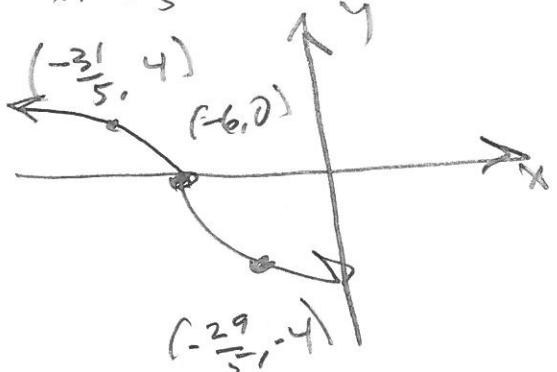
(2M2) $-4f(5x)$

$x \longmapsto \frac{1}{5}x$



(3) $-4f(5x+30) = -4f(5(x+6))$

M1: $x \longmapsto \frac{1}{5}x$ $\qquad$ M2: $x \longmapsto x-6$



(M1) $-\frac{29}{5}$, (M2) $\frac{1}{5} - 6$

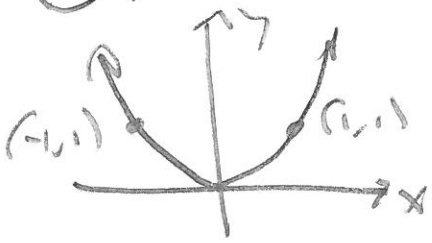
$= -\frac{29}{5}$ ✓

(4) $g(x)$ = previous, down 11

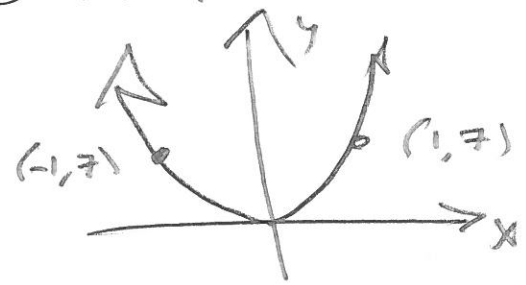
121 WP #2 FALL '19

(6) $g(x) = 7(8x+16)^6 + 9$

(0) $f(x) = x^6$

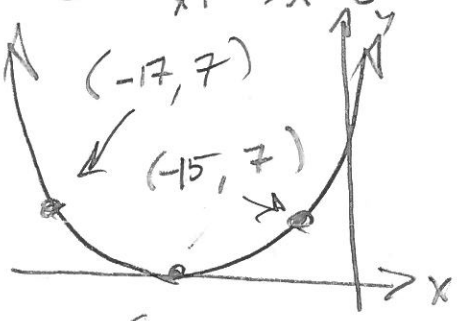


(1) $7f(x) = 7x^6$



(m1) $7f(x+16)$

$x \longmapsto x-16$

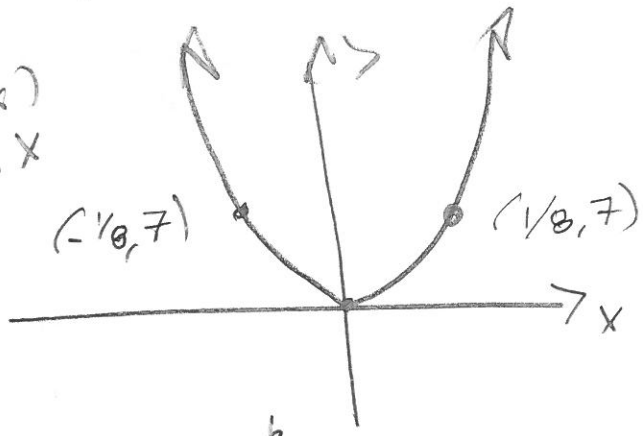


(-16,0)

$7(x+16)^6$

(m2) $7f(8x)$

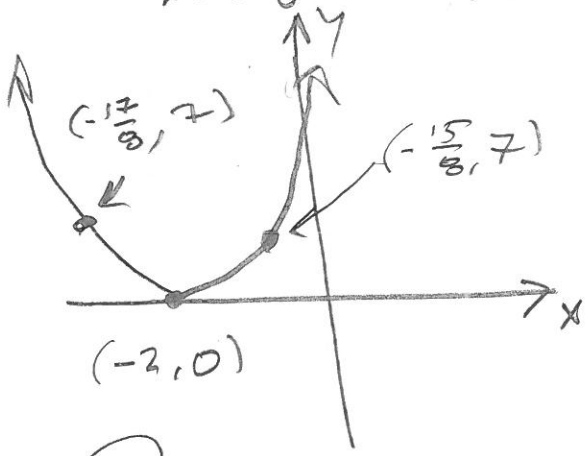
$x \longmapsto \frac{1}{8}x$



$7(8x)^6$

(3) $7f(8x+16) = 7(8(x+2))$

m1: $x \longmapsto \frac{1}{8}x$ m2: $x \longmapsto x-2$



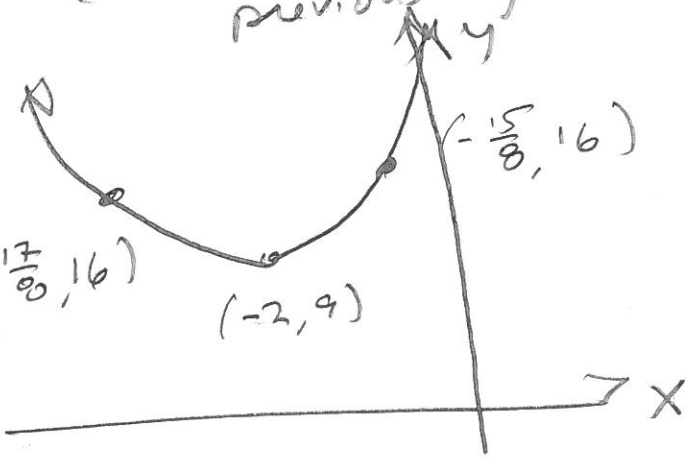
(-2,0)

(m1) $x \longmapsto \frac{1}{8}x$

(m2) $x \longmapsto x-2$

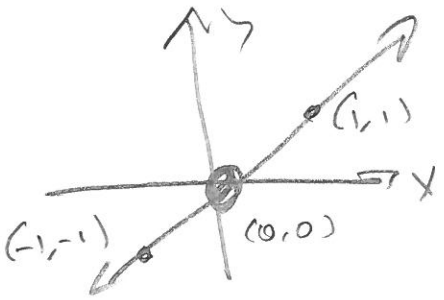
$\left(\frac{1}{8} - 2 = -\frac{15}{8}\right)$

(4) $g(x) = 4p$ g from previous $= y \longmapsto y+9$



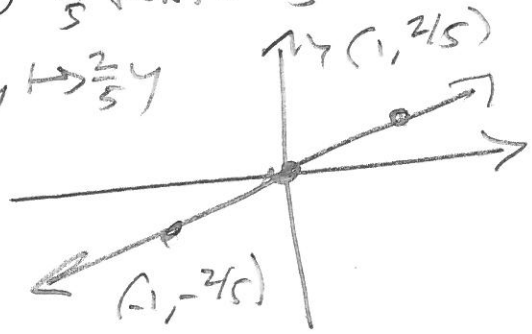
(7) $g(x) = \frac{2}{5}(x+4) + 2$

(0) $f(x) = x$



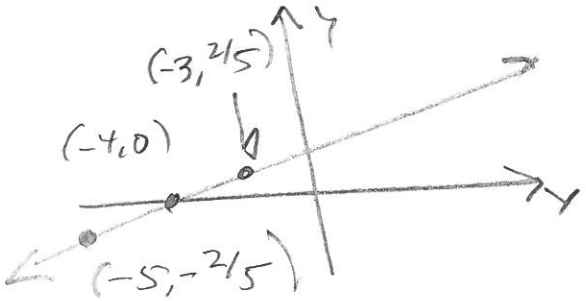
(1) $\frac{2}{5} f(x) = \frac{2}{5} x$

$y \mapsto \frac{2}{5} y$



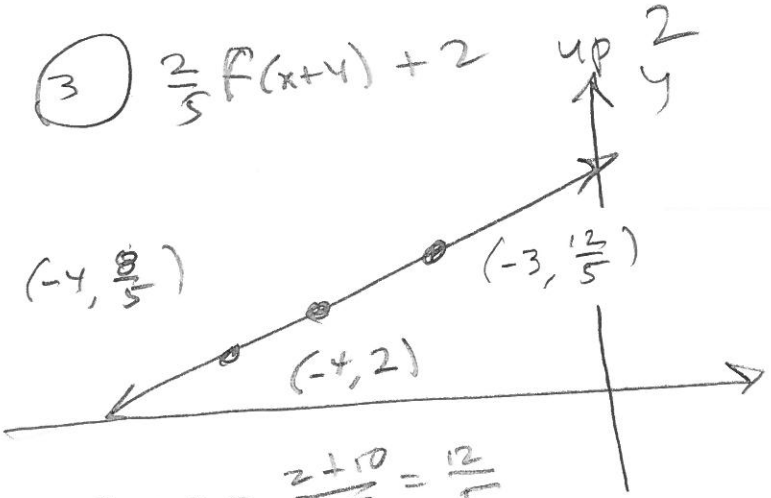
(2) $\frac{2}{5} f(x+4)$

$x \mapsto x - 4$



(3) $\frac{2}{5} f(x+4) + 2$

up 2

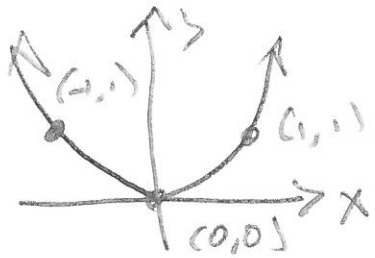


$\frac{2}{5} + 2 = \frac{2+10}{5} = \frac{12}{5}$

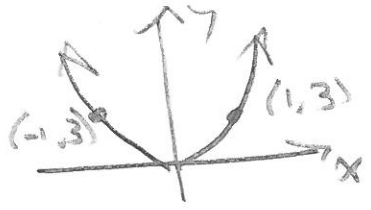
$-\frac{2}{5} + 2 = \frac{-2+10}{5} = \frac{8}{5}$

(8) $g(x) = 3(x-5)^2 + 4$

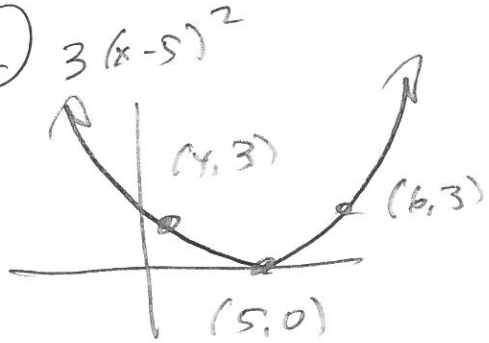
(0) $f(x) = x^2$



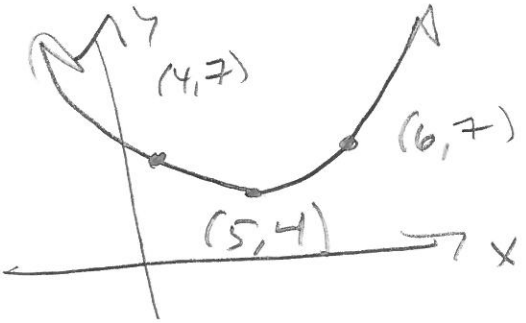
(1) $3x^2$



(2) $3(x-5)^2$



(3) $g(x)$



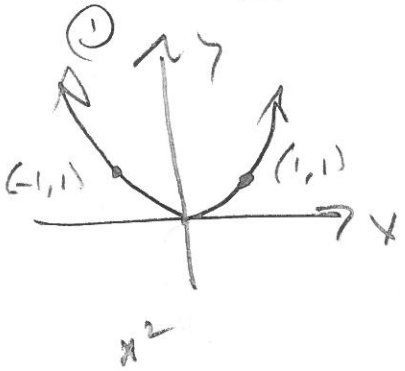
121 WP #2

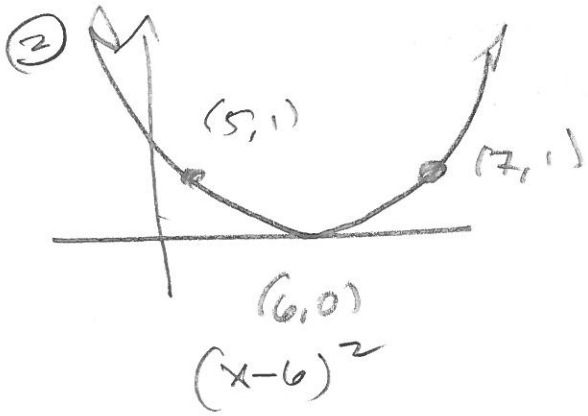
FALL '19

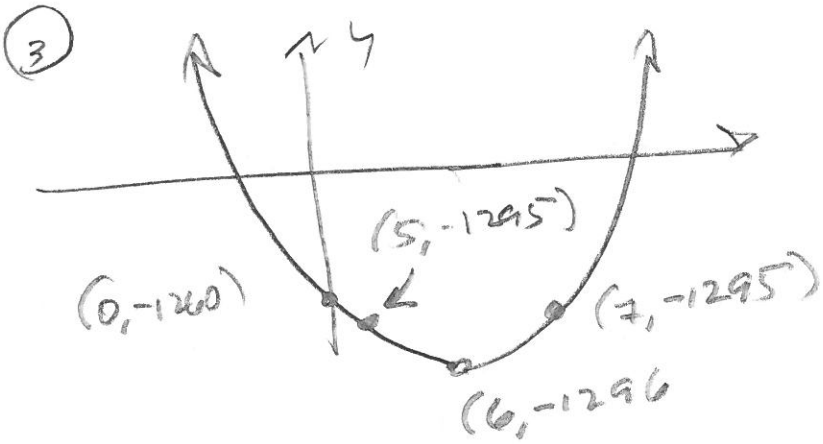
(9) $g(x) = x^2 - 12x - 1260$

$= x^2 - 12x + 6^2 - 36 - 1260$

$= (x-6)^2 - 1296$







(9) $g(x) = x^2 - 12x - 1260$

$= x^2 - 12x + 6^2 - 36 - 1260$

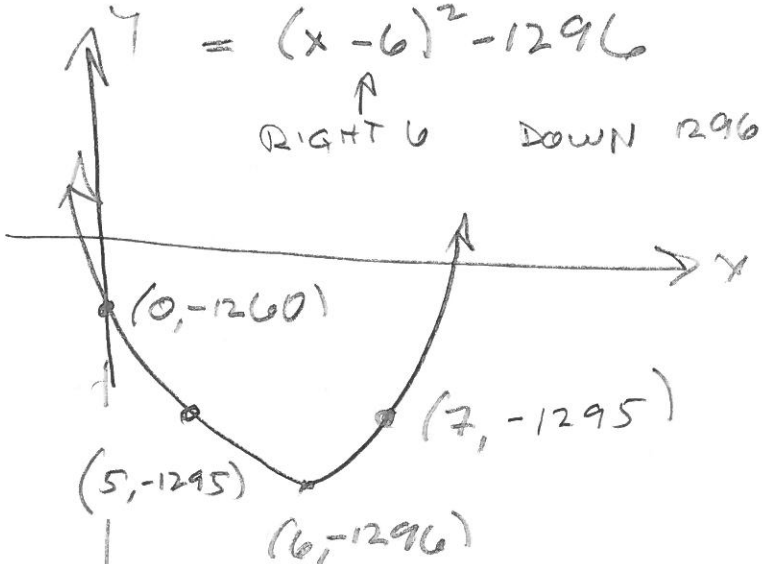
$= (x-6)^2 - 1296$

RIGHT 6 DOWN 1296

$(1,1) \mapsto (7,1) \mapsto (7,-1295)$

$(-1,1) \mapsto (5,1) \mapsto (5,-1295)$

$(0,0) \mapsto (5,0) \mapsto (5,-1296)$



(10) $g(x) = 7x^2 + 3x - 10$

$= 7\left(x^2 + \frac{3}{7}x \quad\right) - 10$

$= 7\left(x^2 + \frac{3}{7}x + \left(\frac{3}{14}\right)^2\right) - 10 - 7\left(\frac{9}{196}\right)$

$= \left(x + \frac{3}{14}\right)^2 - \frac{289}{196}$

stretch $y \mapsto 7y$; Left $3/14$; Down $\frac{289}{196}$

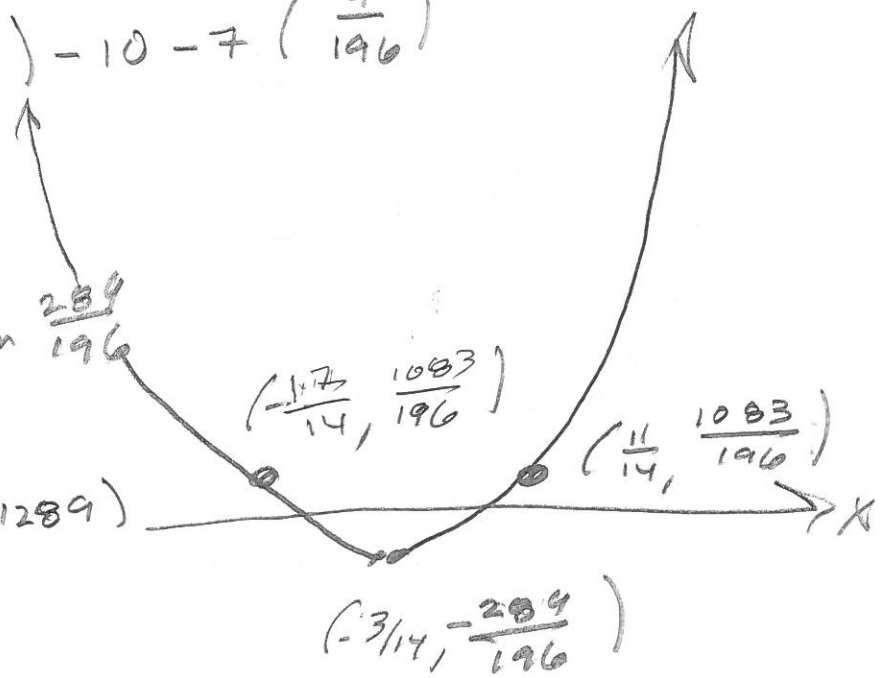
$(1,1) \mapsto (1,7) \mapsto \left(\frac{11}{14}, 7\right) \mapsto \left(\frac{11}{14}, -1289\right)$

$1 - \frac{3}{14} = \frac{11}{14}$

$7 - \frac{289}{196} = \frac{1083}{196}$

$7\left(\frac{9}{196}\right)$

$\frac{63}{196}$



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M1 for parabolas.

(10) $g(x) = 7x^2 + 3x - 10$

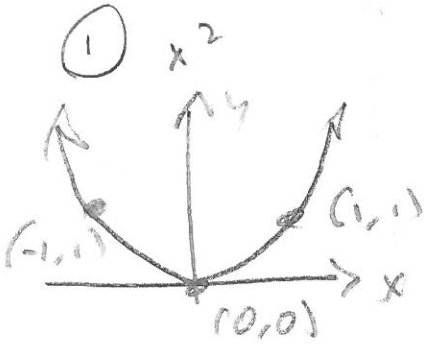
$= 7\left(x^2 + \frac{3}{7}x \quad\right) - 10$

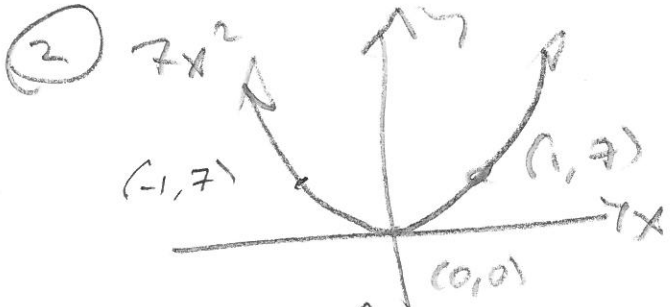
$= 7\left(x^2 + \frac{3}{7}x + \left(\frac{3}{14}\right)^2\right) - 10 - 7\left(\frac{9}{196}\right)$

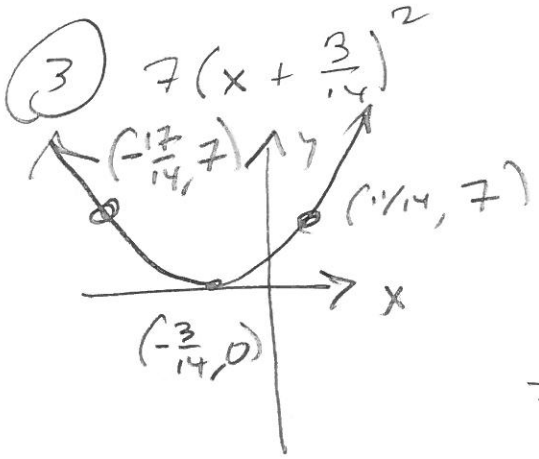
(Scratch: $-10 - 7\left(\frac{9}{196}\right) = -10 - \frac{9}{28} = \frac{-280-9}{28}$

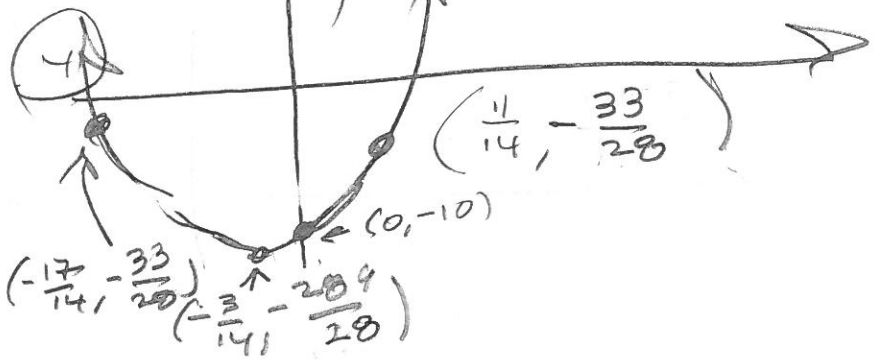
$= -\frac{289}{196}$)

$\ldots = 7\left(x + \frac{3}{14}\right)^2 - \frac{289}{196}$









$7 - \frac{289}{28} = -\frac{93}{28} \approx -3.3214$

$1 - \frac{3}{14} = \frac{11}{14}$

$-1 - \frac{3}{14} = \frac{-17}{14}$