Math 108 4.2 HW

#1(a) $g(x) = (x+1)^3$

Consider a few things before you start:

(1.) What is the "mother function"?

(2.) What is the domain?

(3.) What is the y-intercept, that is, $g(0)$? (Always look for this if $x=0$ is in the domain, because it's so easy to find!)

(1+2) Dom: $\mathbb{R}$ since $y = x^3$ (the mother fcn) has domain $\mathbb{R}$ & $(x+1)^3$ has no restrictions either.

(3.) $g(0) = (0+1)^3 = 1^3 = 1 \longrightarrow$ Plot $(0,1)$

So you can plot this fcn, knowing it has the shape of $y = x^3$, but it will intersect the y-axis at $(0,1)$ rather than $(0,0)$.

Before drawing the curve, find its root (x-intercept) by solving

$$(x+1)^3 = 0$$

That is, $x+1 = 0 \longrightarrow x = -1$

This is why the graph shifts 1 space left.

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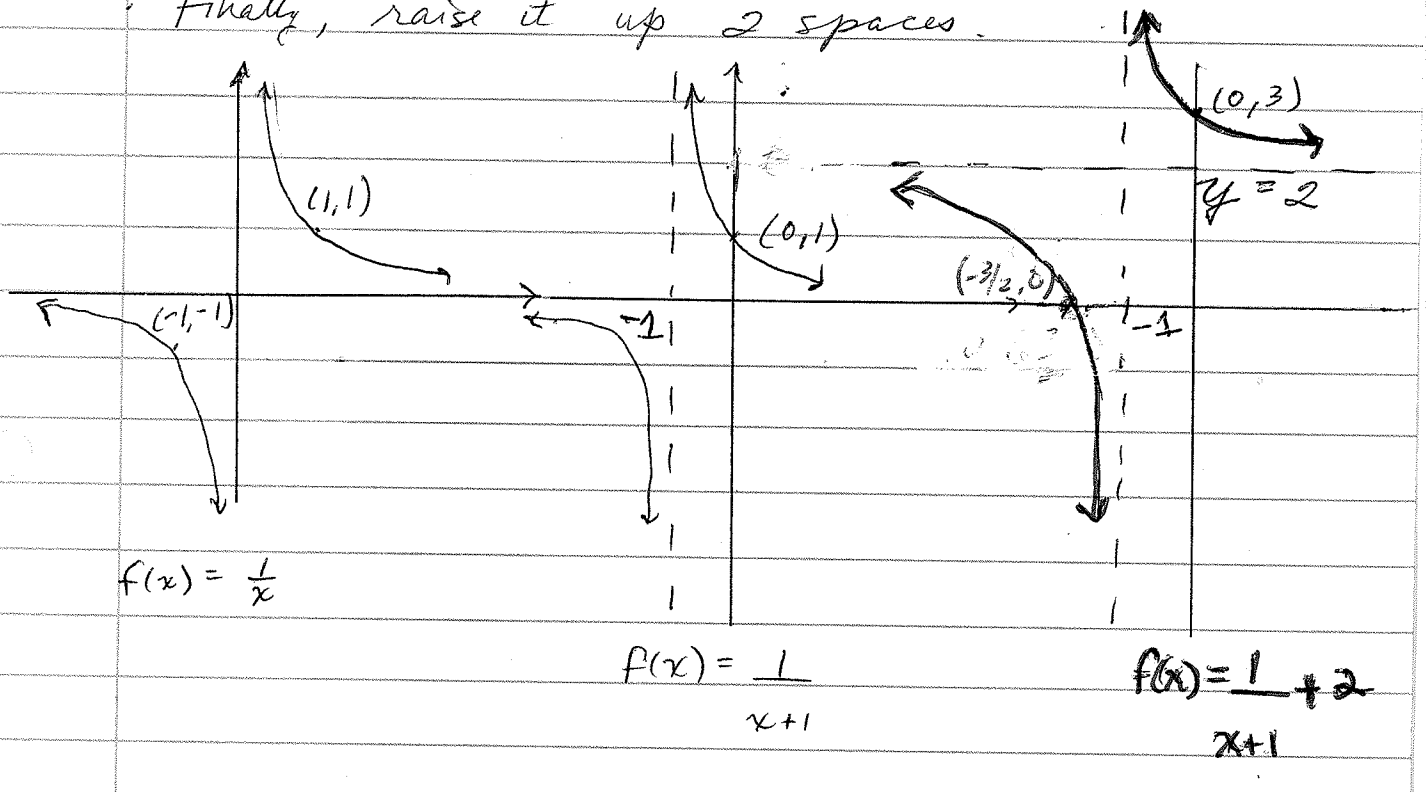
#1c) $g(x) = \frac{1}{x+1} + 2$

- First draw the graph of $f(x) = \frac{1}{x}$
- Next, shift it 1 space left.
- Finally, raise it up 2 spaces.



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

Notice the intercepts & asymptotes.

$f(x)$	VA	$f(0)$	$f(x)=0$	HA
$\frac{1}{x}$	$x=0$ (y-axis)	undefined	undefined	$y=0$
$\frac{1}{x+1}$	$x=-1$	1	undefined	$y=0$
$\frac{1}{x+1} + 2$	$x=-1$	3	$x=-\frac{3}{2}$	$y=2$

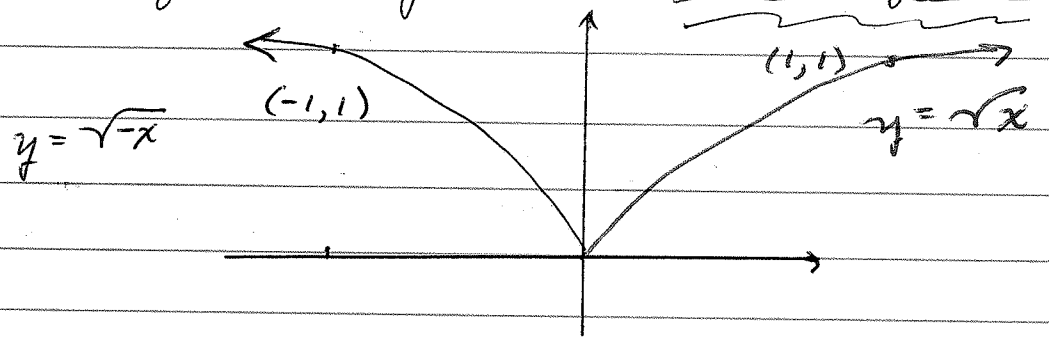
#1i) $g(x) = \sqrt{-x}$

This is another reflected graph.

$y = \sqrt{x}$ is the mother. For $\sqrt{-x}$ to make sense, x must be ≤ 0.

Hence, dom g is $(-\infty, 0]$, and

↑ reflect $y = \sqrt{x}$ across y-axis.



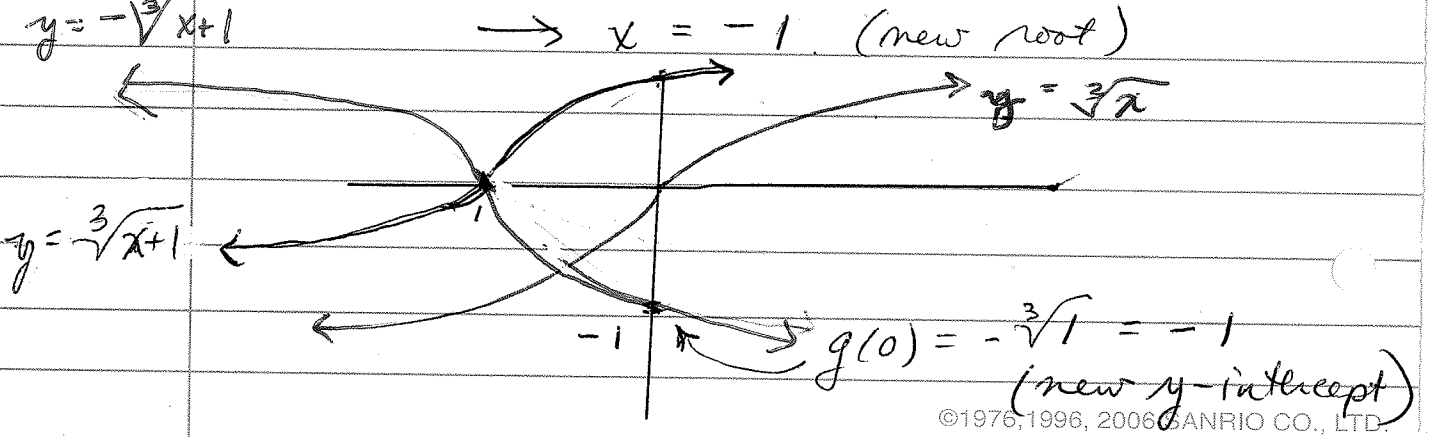
#1m) $g(x) = -\sqrt[3]{x+1}$

This is a reflection across the x-axis.

Since $y = \sqrt[3]{x}$ reflects across the x-axis as $y = -\sqrt[3]{x}$. We have to shift it 1 space left, since the root has shifted that way:

$$0 = -\sqrt[3]{x+1} \implies 0^3 = -(x+1)$$

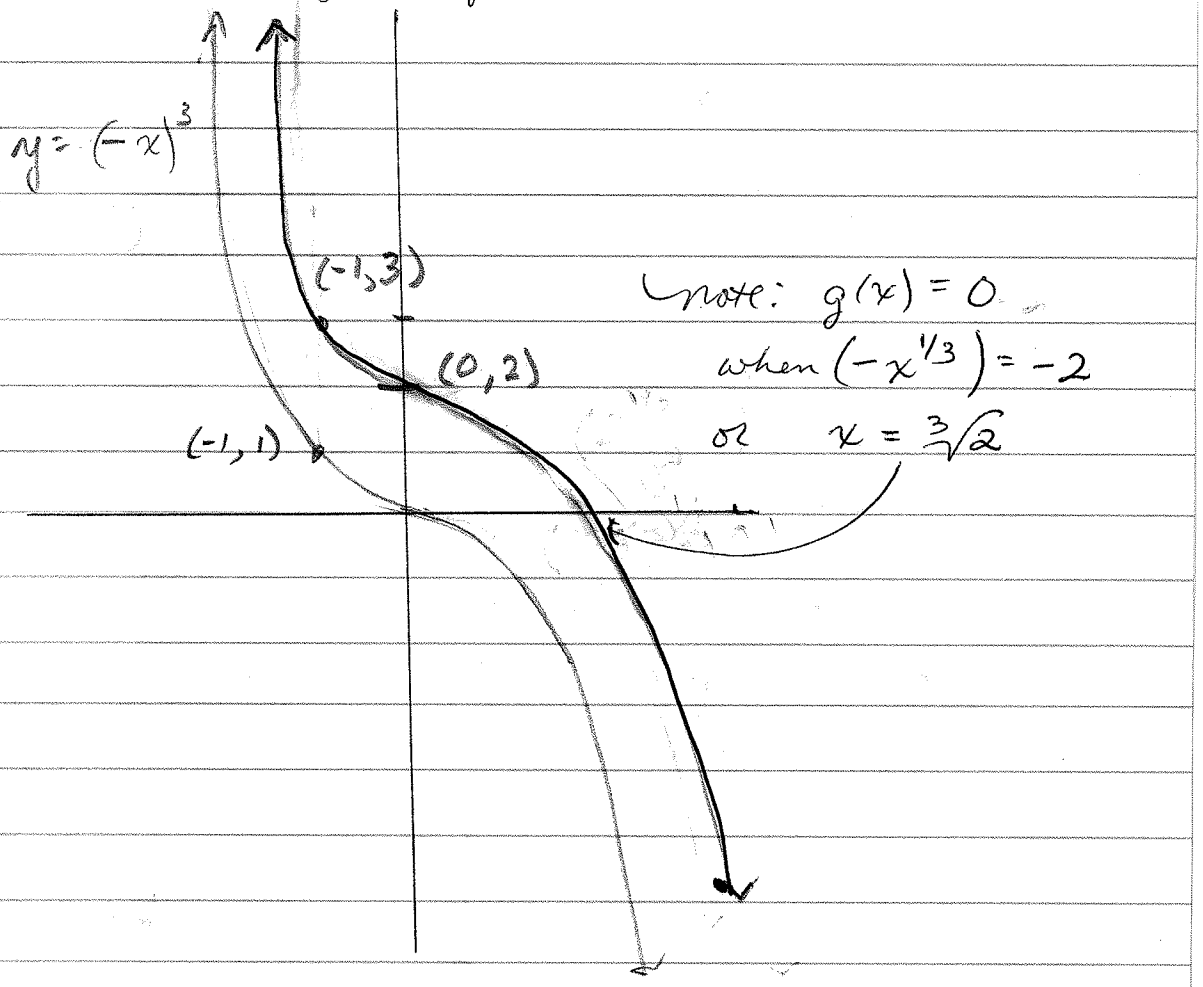
$$\rightarrow x = -1 \text{ (new root)}$$



#1e) $g(x) = (-x)^3 + 2$

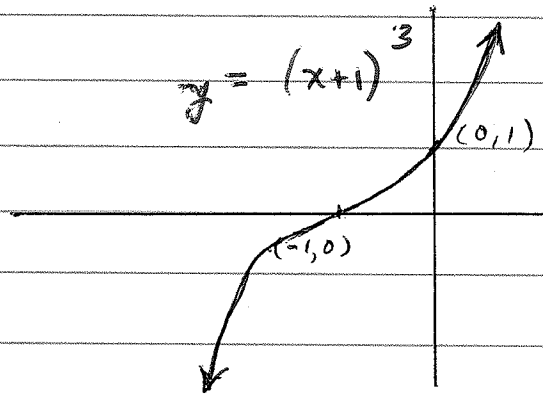
The mother is $y = x^3$. It's an odd fcn, so $f(-x)$ reflects it across the y-axis. (Would an even fcn. be reflected this way? Yes, but you'd get the same plot. e.g. $y = x^2 \equiv (-x)^2$)

We'll shift $y = (-x)^3$ up 2 spaces.



note: $g(x) = 0$ when $(-x^{1/3}) = -2$ or $x = \sqrt[3]{2}$

By the way, the multiplicity of this root is 3, since there is just one root & the degree of g is 3.



This looks awful. It should look exactly like $y = x^3$ but shifted left a space.

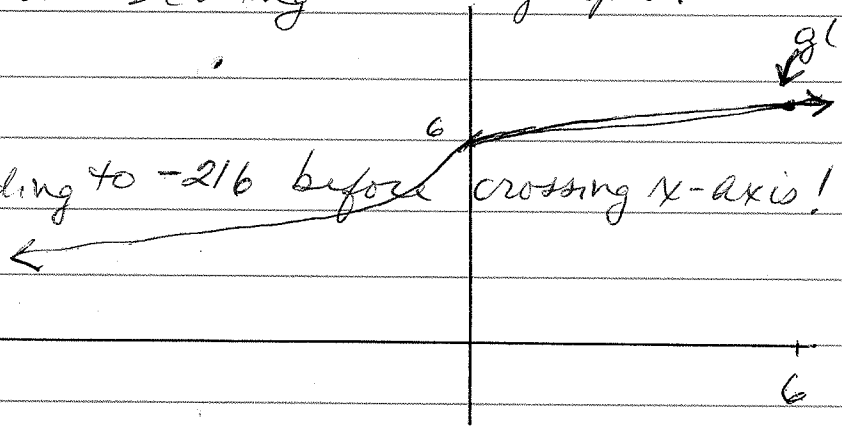
#1 b) $g(x) = \sqrt[3]{x} + 6$

mother fcn: $y = \sqrt[3]{x}$

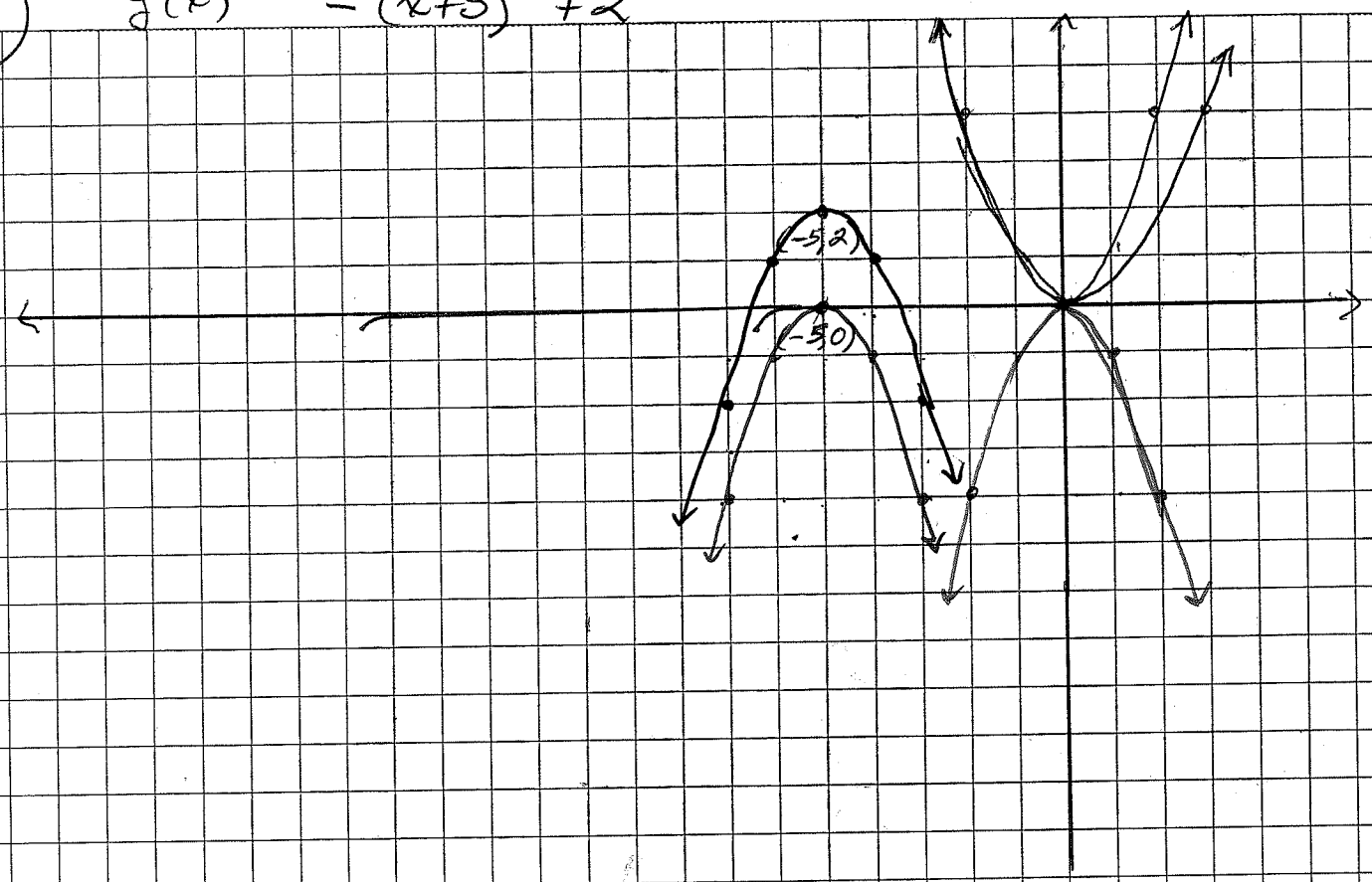
Shifted 6 units up. $g(0) = 6$ (y-int.)

$g(x) = 0 = \sqrt[3]{x} + 6 \longrightarrow x = -216$

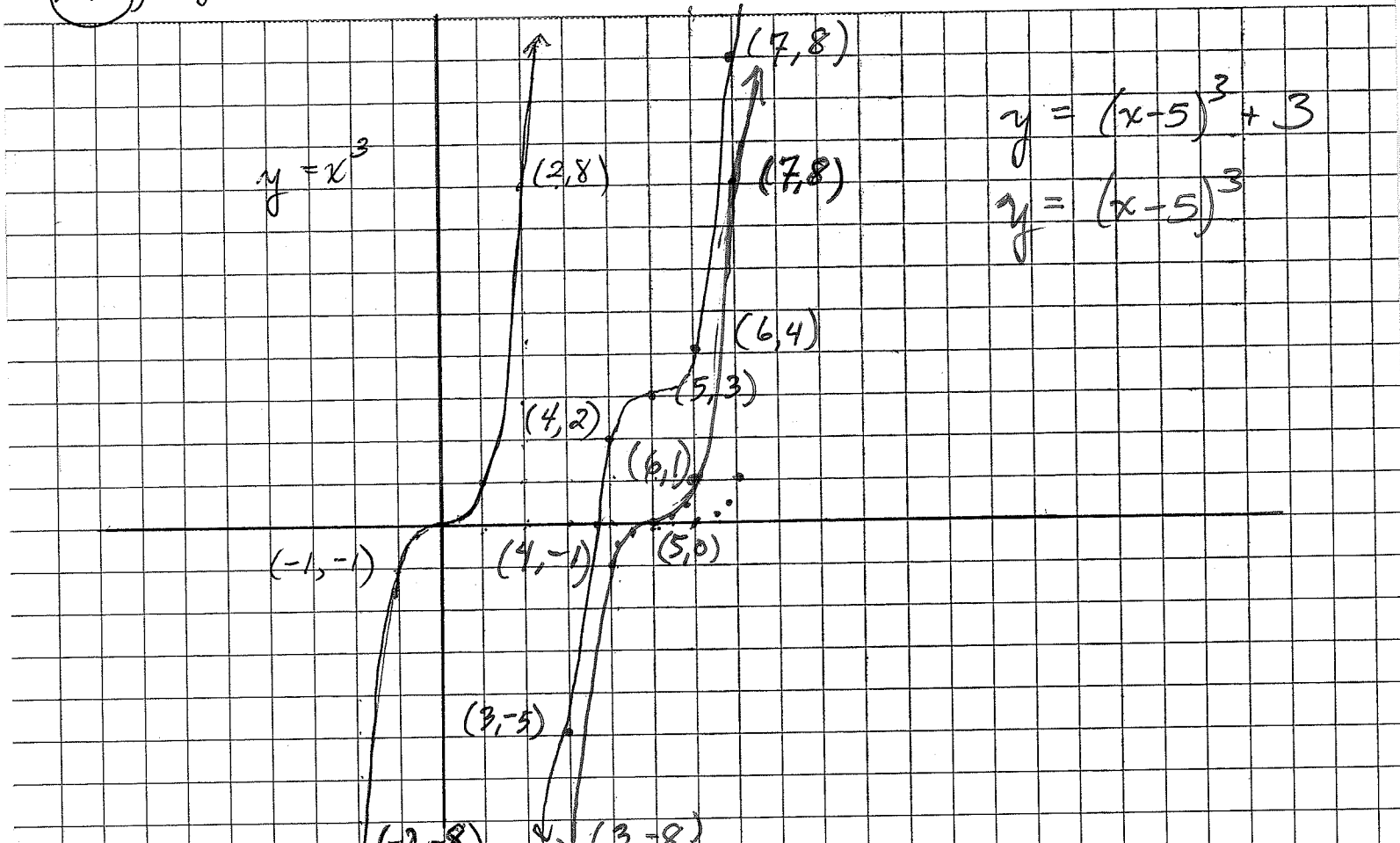
The root is too far left to plot but knowing where it is assists me in scaling the graph.



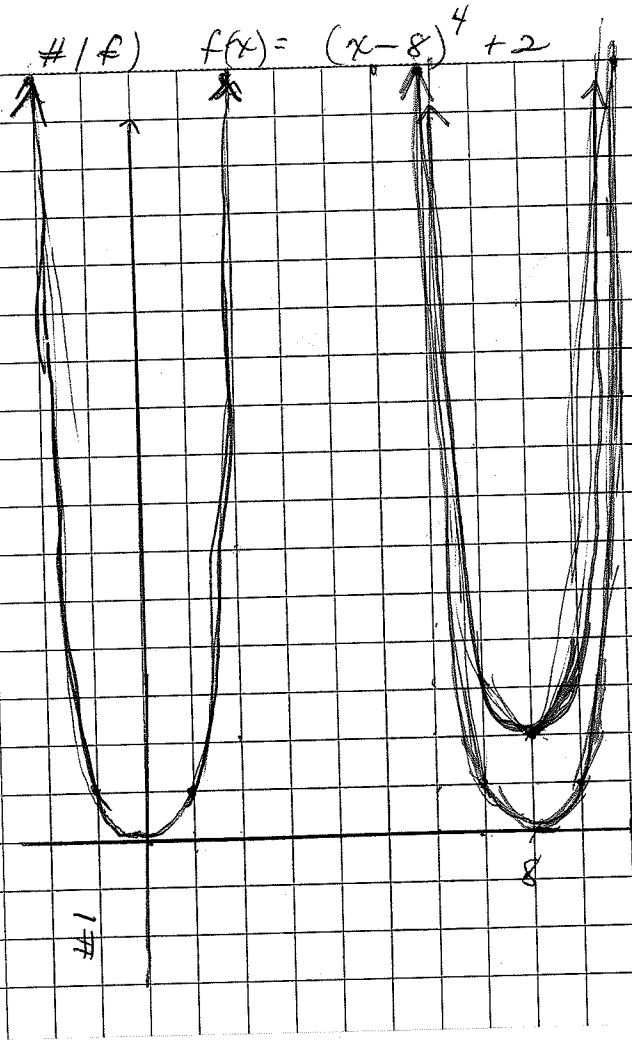
#1g $g(x) = -(x+5)^2 + 2$



#1d) $g(x) = (x-5)^3 + 3$



#1f) $f(x) = (x-8)^4 + 2$



#1f $g(x) = (x-8)^4 + 2$

$y = (x-8)^4 + 2$

$y = (x-8)^4$

$y = x^4$