Quiz 3

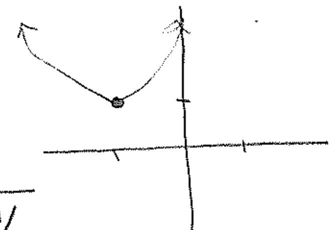
Key

Show *all* your work. No credit is given without reasonable supporting work. There are *two* sides to this quiz.

1. Consider the function $f(x) = 6(x+1)^2 + 1$.

   (a) [1] (WebHW5 #5) Find the coordinates of the vertex and determine if it is a minimum or maximum.

   $(-1, 1)$ (+.5) minimum b/c parabola opens up (+.5)

   (b) [2] (§3.4 #67) Find the roots of f.

   ie find when $6(x+1)^2+1=0$ (+.5)

   alg (+.5)
   i (+.5)

   $6(x+1)^2 = -1$

   $\div 6 \qquad \div 6$

   $(x+1)^2 = -\frac{1}{6}$

   $x+1 = \pm\sqrt{-\frac{1}{6}}$

   $x = -1 \pm \sqrt{-\frac{1}{6}} = -1 \pm i\sqrt{\frac{1}{6}}$

2. Evaluate the expressions:

   (a) [1] (§3.4 #21) $\frac{1}{3}i - (\frac{1}{4} - \frac{1}{6}i)$.

   dist (+.5)
   alg (+.5)

   $\frac{1}{3}i - (\frac{1}{4} - \frac{1}{6}i)$

   $= \frac{1}{3}i - \frac{1}{4} + \frac{1}{6}i$

   $= \frac{2}{6}i - \frac{1}{4} + \frac{1}{6}i$

   $= -\frac{1}{4} + \frac{3}{6}i$

   $= -\frac{1}{4} + \frac{1}{2}i$

   (b) [2] (WebHW6 #4) $\frac{4-7i}{1-4i}$.

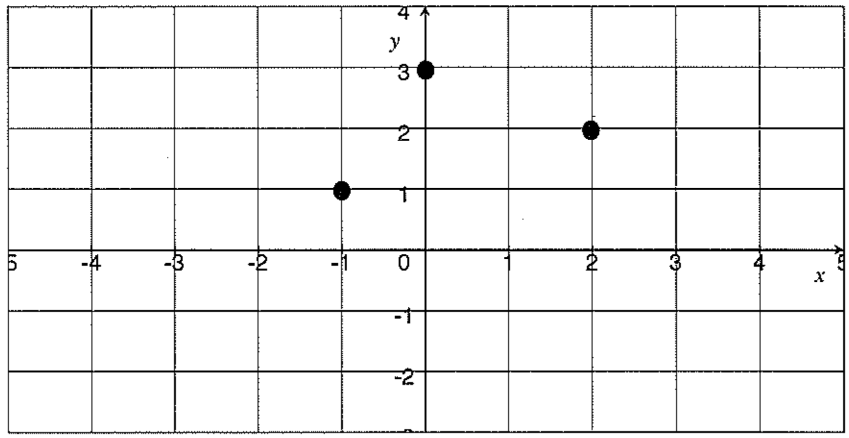
   $\frac{4-7i}{1-4i} \cdot \frac{(1+4i)}{(1+4i)}$ (+.5) (+.5) $= \frac{4+16i-7i-28i^2}{1+\cancel{4i}-\cancel{4i}-16i^2}$

   $i^2 = -1$ (+.5)

   $= \frac{4+28+(16-7)i}{1-16(-1)} = \frac{32+9i}{17}$

   $= \frac{32}{17} + \frac{9}{17}i$ Simplify/alg (+.5)

3. (Inverse Wks) Let n be the function defined by the following graph to the right:



(a) [1] (Inverse Wks) Does n have an inverse function? Why or why not?

yes b/c it passes the horizontal line test.

(+.5)

actually does pass (+.5)

(b) [1] (WebHW6 #6) Find $n^{-1}(3)$ if possible.

$n^{-1}(3) = ?$ when $n(?) = 3$ (+.5) note

x	$n(x)$
-1	1
0	3
2	2

$? = 0$ (+.5)

4. [2] (WebHW5 #8) A manufacturer finds that the revenue generated by selling x units of a certain commodity is given by the function $R(x) = 60x - 0.2x^2$, where the revenue $R(x)$ is measured in dollars. What is the maximum revenue, and how many units should be manufactured to obtain this maximum?

Note: guess and check is *not* the way to get credit for this problem.

start (+.5)

Note $R(x)$'s graph is a parabola opening down so to maximize the revenue we want to find the vertex. (+.5)

$R(x) = 60x - .2x^2$

$-\frac{10}{2}\left[R(x)\right] = \left[-\frac{2}{10}x^2 + 60x\right]-\frac{10}{2}$

$-5R(x) = x^2 - 300x$

$+\left(\frac{-300}{2}\right)^2 \qquad + \left(\frac{300}{2}\right)^2$

$-5R(x) + 150^2 = x^2 - 300x + 150^2$

$-5R(x) + 150^2 = (x-150)^2$

$-5R(x) = (x-150)^2 - 150^2$

$R(x) = -\frac{1}{5}\left[(x-150)^2 - 150^2\right]$

$-\frac{1}{5}(x-150)^2 + \frac{1}{5}150 \cdot 150 = R(x)$

$-\frac{1}{5}(x-150)^2 + 30 \cdot 150 = R(x)$

$-\frac{1}{5}(x-150)^2 + 4500 = R(x)$

steps (+.5)

$\Rightarrow$ vertex $(150, 4500)$

found (+.5)

interpret (+.5)

So manufacturing 150 units will bring in the maximum revenue of \$4,500