

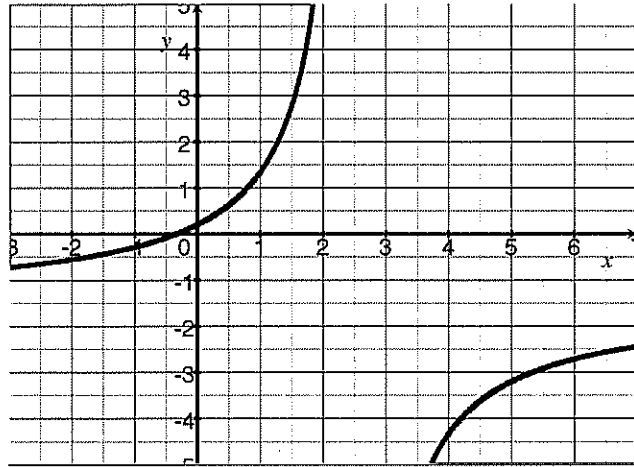
Quiz 3

Key

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

1. [2] (§2.8 #39) The graph of $g(x) = \frac{1+3x}{5-2x}$ is given below. If g has an inverse function, find it.

Note that g passes the horizontal line test so g^{-1} exists.



$$\frac{1+3g^{-1}(x)}{5-2g^{-1}(x)} = x \quad \text{or} \quad \frac{1+3y}{5-2y} = x$$

$$1+3g^{-1}(x) = x(5-2g^{-1}(x))$$

$$1+3g^{-1}(x) = 5x-2xg^{-1}(x)$$

$$1+3y = x(5-2y)$$

$$1+3y = 5x-2xy$$

$$1-5x = -3g^{-1}(x) - 2xg^{-1}(x)$$

$$1-5x = g^{-1}(x)[-3-2x]$$

$$\Rightarrow \frac{1-5x}{-3-2x} = g^{-1}(x)$$

$$\Rightarrow 1-5x = -3y-2xy$$

$$\Rightarrow 1-5x = y(-3-2x)$$

$$\Rightarrow \frac{1-5x}{-3-2x} = y$$

alg (+.5)
got it (+.5)

2. [2] Perform the addition or division and write the result in the form $a + bi$

(§3.4 #17) $(7 + \frac{1}{2}i) - (5 + \frac{3}{2}i)$

dist (+.5) $7 + \frac{1}{2}i - 5 - \frac{3}{2}i$

$$2 - \frac{2}{2}i$$

got it (+.5) $2 - i$

(§3.4 #33) $\frac{2-3i}{1-2i} \cdot \frac{1-2i}{1-2i}$

cong (+.5) $\frac{2-3i}{1-2i} \cdot \frac{1+2i}{1+2i} = \frac{(2-3i)(1+2i)}{(1-2i)(1+2i)}$

got it (+.5) $= \frac{2+4i-3i-6i^2}{1+2i-2i-4i^2}$ b/c $i^2 = -1$

$$= \frac{2+i+6}{1+4} = \frac{8+i}{5}$$

$$= \frac{8}{5} + \frac{1}{5}i$$

3. Let $q(x) = -2x^2 + 9x - \frac{81}{8}$.

(a) [3] (§2.5 #11) Complete the square to write q in vertex form (i.e. $a(x-h)^2 + k$).

(+1.5) $\frac{q(x)}{-2} = \frac{-2x^2 + 9x - \frac{81}{8}}{-2}$

$-\frac{1}{2}q(x) = x^2 - \frac{9}{2}x + \frac{81}{16}$

note $(\frac{9}{2})^2 = (\frac{9}{4})^2 = \frac{81}{16}$ (+1.5)

so we have a perfect \square on the right

$-\frac{1}{2}q(x) = (x - \frac{9}{4})^2$ factor (+1.5)

$\rightarrow \times 2 \left[-\frac{1}{2}q(x) \right] = \left[(x - \frac{9}{4})^2 \right] \cdot -2$

$q(x) = -2(x - \frac{9}{4})^2$

clean up (+1.5)
alg (+1.5)

(b) [2] (§2.4 #25) List the graph transformations that would transform the graph of $f(x) = x^2$ into the graph of q . Be sure to list the transformations in order.

(+1.5) vertical flip over the x-axis (corresponds to neg sign)

(+1.5) vertical stretch by a factor of 2 (corresponds to 2)

(+1.5) horizontal shift to the right by $\frac{9}{4}$ (corresponds to $-\frac{9}{4}$)

note: the above graph transformations are independent & could be done in any order.

(c) [1] (§2.8 #5) Does q have an inverse? Justify your answer.

nope. Given (b), the graph of q looks like which fails the horizontal line test.

reason (+1.5)

