

The final exam will be on September 22 Tuesday during the normal class period. It should take about an hour if you do it carefully, so we can spend the beginning of that class period on review. You may use one sheet of notes that you've written yourself, but not your textbook or anything else not written by you, and you may not communicate with anybody but me. Also, you may use a calculator if you wish, although you shouldn't really need one.

The answers to the questions in this exam are on the last page.

- 1 Evaluate and simplify the following expressions. Give exact answers using radical symbols or the imaginary unit if necessary, *not* decimal approximations. Make sure that your denominators are rational and that all fractions are reduced. Show at least one intermediate step for each.

a $\sqrt[3]{48}$

b $(3 + \sqrt{2})(4 - \sqrt{2})$

c $\frac{3+i}{4-i}$

- 2 Factor the following polynomials completely.

a $4x^3 + 12x^2 + 8x$

b $3n^2 + 8n + 5$

c $p^4 - 9q^4$

- 3 Simplify the following algebraic expressions. If it helps, you may assume that each variable takes only positive values. Show at least one intermediate step in each part.

a $\frac{2x-6}{x^2+2x} + \frac{3}{x}$

b $\sqrt{18xy^4}$

c $(\sqrt{x}+3)(\sqrt{x}-2)$

- 4 Solve the following equations. Give exact answers using radical symbols or the imaginary unit (if necessary), *not* decimal approximations. Make sure that your denominators are rational and that all fractions are reduced.

a $5x^2 + 2x = 4$

b $\frac{3}{2x+4} = \frac{2}{x+3}$

c $x - \sqrt{x} - 6 = 0$

- 5 Solve the following word problems, and be sure to include appropriate units in your final answers.

a Suppose that you run a marathon, alternating between jogging and walking, so that your total walking distance is 12 miles and your total jogging distance is 14 miles. You jog 3 miles per hour faster than you walk, and it takes you 5 hours to complete the race. If this is so, then how fast do you walk?

b The width of a computer screen is 5 centimetres greater than its height. The diagonal distance is 25 centimetres. What is the width of the screen?

6 Consider the equation $y + 1 = x^2 + x$, and consider its graph in the (x, y) -plane.

a Is the point $(1, 3)$ on this graph?

b Draw a graph of this equation; try to make it clear, and be sure to label the scale.

7 Consider the function f given by

$$f(x) = 2x + 3.$$

a If $x = 4$, then what is $f(x)$?

b If $f(x) = 5$, then what is x ?

c Give at least two points on the graph of f . (Hint: Use your answers to parts a and b.)

Answers

1

a $2\sqrt[3]{6}$

b $10 + \sqrt{2}$

c $\frac{11+7i}{17} = \frac{11}{17} + \frac{7i}{17} = \frac{11}{17} + \frac{7}{17}i$

2

a $4x(x+1)(x+2)$

b $(n+1)(3n+5)$

c $(p^2 - 3q^2)(p^2 + 3q^2)$

3

a $\frac{5}{x+2}$

b $3y^2\sqrt{2x}$

c $x + \sqrt{x} - 6$

4

a $x = \frac{-1 \pm \sqrt{21}}{5} = -\frac{1 \pm \sqrt{21}}{5} = -\frac{1}{5} \pm \frac{\sqrt{21}}{5} = -\frac{1}{5} \pm \frac{1}{5}\sqrt{21}$

b $x = 1$

c $x = 9$

5

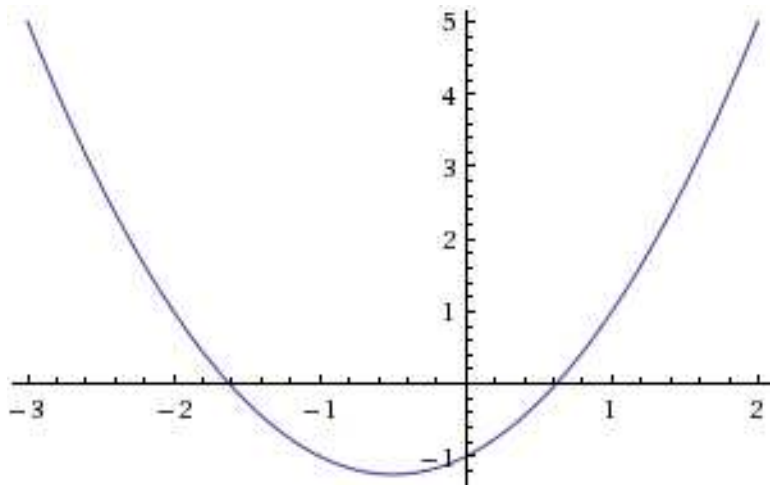
a 4 mi/hr

b 20 cm

6

a No

b



7

a 11

b 1

c (4, 11) and (1, 5)