

**This with-calculator portion of the test consists of just one problem.**

- 1 My neighbor's house sits on an absolutely smooth, level, lot. His house walls are perfectly vertical. He has found a Canadian-government website which recommends the following for placement of extension ladders:

“Place the ladder feet so that the horizontal distance between the feet and the base of the wall is  $\frac{1}{4}$  of the length of the ladder.

Suppose my neighbor follows this rule in setting up a long ladder. He puts the ladder's feet **8 feet** out from the base of the wall.

Show steps in figuring the length of the ladder. Also show steps in figuring how far up the wall the ladder reaches. Round your answers to three decimal places.

- 2 To four decimal places,  $\sqrt{\pi + \pi^{2/3}} \approx$  \_\_\_\_\_

This part of the test has pages 2 – 7. Take a moment to make sure you have them all.

3 Simplify to a form not involving negative or zero exponents:  $\left(\frac{2a^3b^{-2}}{3a^4b^{-3}}\right)^3$

4 Show steps in finding all solutions of the equation

$$\frac{3x - 3}{x} - \frac{4x - 3}{x - 1} = \frac{3}{x^2 - x}$$

5 Carry out the operations and simplify:

(a)  $(x^2 + x - 6)(x^2 - 5x + 6)$

(b)  $(x^2 + x - 6) - (x^2 - 5x + 6)$

(c)  $(x^2 + x - 6)^2$

(d)  $\frac{1}{x^2 + x - 6} - \frac{1}{x^2 - 5x + 6}$

6 Simplify:

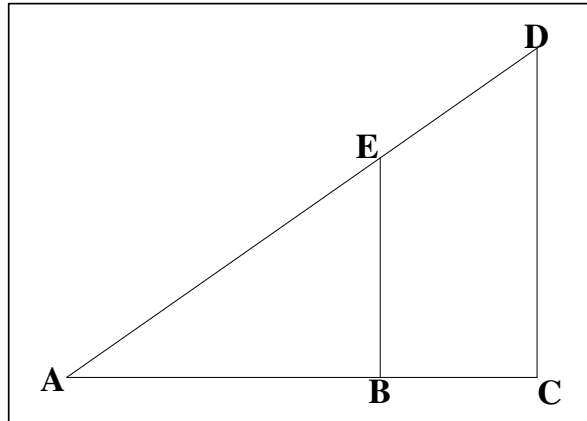
(a) 
$$\frac{4ab^{-1} - 4a^{-1}b}{b^{-1} + a^{-1}}$$

(b) 
$$\frac{(4ab^{-1})(4a^{-1}b)}{b^{-1}a^{-1}}$$

7 Factor:

(a) 
$$2(x - 10)(x - 12)^3 + 3(x - 10)^2(x - 12)^2$$

- 8 In the following figure suppose that  $\overline{AE} = 30$  (that is, it's 30 units from point  $A$  to point  $E$ ),  $\overline{AB} = 24$ , and  $\overline{DE} = 15$ . Find the lengths  $\overline{BE}$  and  $\overline{CD}$ .



- 9 Show equation-solving steps in finding *all*  $x$ -values for which the following equation holds:

$$\sqrt{25 - x^2} = 5 - 2x$$

- 10 Show steps in solving the inequality

$$\frac{x + 1}{(x - 2)(x + 3)} \geq 0.$$

Announce your answer two ways:

- (i) as a number-line graph                      (ii) in interval notation.

11 The theory of the quadratic formula:

(a) State the quadratic formula. That is, write down this formula and explain briefly what it's a formula for.

(b) Derive the quadratic formula. That is, show why the formula is true by deriving it from more basic ideas.