

You must show your work to receive credit. Use proper mathematical sentences (= signs, parentheses, etc.). If you depend on the calculator for an answer, explain exactly what buttons you pushed. **Be sure to spell out a clear answer to every question asked.**

1. (15 points) Solve the equations:

a) $\frac{x}{4} - 5 = 4 - \frac{x}{5}$

b) $x(x^{99} + 6) = 9 + x^{100}$

c) $x^2 - 6x - 7 = 0$

d) $5x^5 = 20x^3$

e) $25(x^2 - 5) = x(x^2 - 5)$

2. (6 points) Find the numbers A and B such that we have, for all x , the identity

$$x^2 - 14x + 50 = (x - A)^2 + B.$$

Deduce the solutions of $x^2 - 14x + 50 = 0$. Are they real?

3. (16 points) Find all real solutions of each equation:

a) $\left(\frac{s+1}{s-1}\right)^2 - \left(\frac{s+1}{s-1}\right) - 2 = 0$

b) $10t - 101\sqrt{t} + 10 = 0$

c) $\sqrt{3u+4} = u$

d) $|3v+4| = v$

4. (12 points) Write each expression in the standard form $a + bi$:

a) $(7 + 6i) - (-2 + i)$

b) $7i(2 - 2i)$

c) $(\sqrt{3} + i)^3$

d) $\frac{1 + 5i}{1 + i}$

5. (16 points) Give the solution set of each inequality (or combined inequality) in interval notation. Also graph the solution set.

a) $-5x + 1 \leq -9$

b) $11 \leq 5x - 4 < 26$

c) $|x - 3| + 5 \leq 7$

d) $0 < \frac{2}{x} < \frac{3}{4}$

6. (9 points) Center City East Parking Garage has a capacity of 253 cars more than Center City West Parking Garage. If the combined capacity for the two garages is 1229 cars, find the capacity for each garage.

7. (9 points) The formula $A = P(1 + r)^2$ is used to find the amount of money, A , in an account after P dollars have been invested in the account paying an annual interest rate, r , for 2 years. Find the interest rate r if \$500 grows to \$720 in 2 years.

8. (9 points) At Bargain Car Rental, the cost of renting an economy car for one day is \$19.95 plus 20 cents per mile. At Best Deal Car Rental, the cost is \$24.95 plus 15 cents per mile. Write and solve an inequality to find the range of miles driven in which Best Deal is a better deal than Bargain.

9. (9 points) A chemist needs 200 milliliters of a 67% solution, but has only 59% and 79% solutions available. Find how many milliliters of each should be mixed to get the desired solution.

10. (9 points) During a hurricane evacuation from the east coast of Georgia, a family traveled 300 miles west. For part of the trip, they averaged 50 mph, but as the congestion got bad, they had to slow down to 30 mph. If the total time of travel was 8 hours, how many miles did they drive at the reduced speed?