

Show all your work if you want to receive credit.

1. Completely factor each of the following. Answers should not contain any negative exponents.

(a)  $7x^3 - 5x^2 - 2x$

(b)  $9x^4 - 36x^2$

(c)  $x^3 - 8y^6$

(d)  $A^{2/3}B^{-2/5} - A^{8/3}B^{-8/5}$

2. Solve each of the following. Answers may be real or complex.

(a)  $x - \sqrt{x+1} = 1$

(b)  $x^4 - 64 = 0$

(c)  $x^4 - 8x = 0$

(d)  $|3x - 1| < 0.02$

3. Use the method of completing the square to derive the quadratic formula.

4. Steve invests \$12,000, part at 6.1% and part at 1.1%. The total interest earned in one year by the two accounts is \$509.50. How much is invested in each account?

5. Working together, two people can paint a house in 12 days. If the first person works alone, he can do the job in 25 days. How long would it take the second person working alone?

6. Working together, two people can paint a house in 12 days. If the first person works alone for one day and then the two people work together until the job is done, how long does the second person work?

7. A small plane was scheduled to fly from Atlanta to Washington, D. C. The plane flies at a constant speed of 150 miles per hours (mph). However, the flight was against a headwind of 10 mph. The threat of mechanical failure forced the plane to turn back, and it returned to Atlanta with a tailwind of 10 mph, landing 1.5 hours after it had taken off. How far had the plane traveled before turning back?

8. To make a rectangular concrete patio, the homeowner used 70 feet of forms to make the perimeter. The concrete was 6 inches thick and had a total volume of 138 cubic feet. What were the dimensions of the patio?

9. A dog runs from point  $A$  to point  $B$  at 5 mph and from point  $B$  to point  $C$  at 3 mph. Point  $A$  is at  $(0, 10)$ , point  $B$  is at  $(x, 0)$  and point  $C$  is at  $(3, 1)$ . The total time that the dog runs is 1 hour. Find the equation that can be used to determine  $x$ . Do not solve.

10. A pipeline runs from point  $A$  to point  $B$  and from point  $B$  to point  $C$ . The cost of the pipeline along  $AB$  is \$200,000 per mile and the cost of the pipeline along  $BC$  is \$100,000 per mile. Point  $A$  is at  $(0, 10)$ , point  $B$  is at  $(x, 0)$  and point  $C$  is at  $(30, 0)$ . The total total cost of the pipeline is \$5,000,000. What is  $x$ , to the nearest tenth of a mile? Note, that the locations of  $A$ ,  $B$  and  $C$  are given in miles.