# SKILLS PORTFOLIO C
## Polynomials, Polynomial Functions, and Factoring

**1.** Textbook #73 page 310 The common cold is caused by a rhinovirus. After *x* days of invasion by the viral particles, the number of particles in our bodies, f(x), in billions, can be modeled by the polynomial function $f(x) = -0.75x^4 + 3x^3 + 5$. Use the leading coefficient test to determine the graph's end behavior to the right. What does this mean about the number of viral particles in our bodies over time?

**2**. If $f(x) = x^2 - 3x + 7$, find each of the following and simplify:

a) $f(a+2)$ b) $f(a+h) - f(a)$

**3**. Simplify: $(y^n + 2)(y^n - 2) - (y^n - 3)^2$

**4.** Factor each polynomials completely:

a) $2y^7(3x-1)^5 - 7y^6(3x-1)^4$ b) $x^{4n} + x^{2n} + x^{3n}$

c) $3x^{3m}y^m - 6x^{2m}y^{2m}$ d) $24x^2 + 3xy - 27y^2$

e) $x^n y^n + 3x^n + y^n + 3$ f) $15x^3 - 25x^2 + 10x$

**5**. Factor by introducing an appropriate substitution.

a) $2x^4 - x^2 - 3$ c) $3(x-2)^2 - 5(x-2) - 2$ e) $a^{2n+2} - a^{n+2} - 6a^2$

b) $2x^6 + 11x^3 + 15$ d) $9x^{2n} + x^n - 8$

**6.** Factor completely.

a) $x^2 - 0.5x + 0.06$ c) $0.04x^2 + 0.12x + 0.09$ e) $acx^2 - bcx + adx - bd$

b) $x^2 - \frac{6}{25} + \frac{1}{5}x$ d) $8x^4 - \frac{x}{8}$ f) $x^5 - x^3 + 27x^2 - 27$

**7.** Textbook # 105 page 345 A diver jumps directly upward from a board that is 32 feet high. The function $f(t) = -16t^2 + 16t + 32$ describes the diver's height above the water, *f(t)*, in feet, after *t* seconds.

a) Find and interpret *f(1)*. b) Find and interpret *f(2)*.

**8.** Factor completely:

a) $4a^3c^2 - 16ax^2y^2$ d) $x^3 - 6x^2 - x + 6$ g) $x^2 - 6x + 9 - y^2$ j) $216x - x^4$

b) $8x^2 + 8y^2$ e) $16x^2 - 40xy + 25y^2$ h) $25x^2 - 20x + 4 - 81y^2$ k) $x^9 + 1$

c) $1 - 81x^4$ f) $x^2 - 8xy + 64y^2$ i) $125x^3 - 8$ l) $x^3 + (x+y)^3$

**9**. Solve each equation by factoring.

a) $x^2 - 4x = 45$ (A: -5,-9) e) $(2x-1)\left(3x + \frac{1}{2}\right)(x-1)^2 = 0$ d) $\frac{x^2}{4} - \frac{5x}{2} + 6 = 0$ (A: 4, 6)

b) $x^2 = 8x$ (A: 0,8) f) $x^3 + 4x^2 - 25x - 100 = 0$ (A: -5, -4, 5)

c) $(x-3)(x+8) = -30$ (A: -3, -2) g) $3x^4 - 48x^2 = 0$ (A: -4, 0, 4)

h) $x(x+1)^3 - 42(x+1)^2 = 0$ (A: -7, -1, 6) i) $|x^2 + 2x - 36| = 12$ (A: -8, -6, 4, 6)

**10**. Textbook # 67, 68 page 373 The function $f(x) = -\frac{1}{4}x^2 + 3x + 17$ models the number of people, f(x), in millions, receiving food stamps x years after 1990.

a) In which year did 25 million people receive food stamps? (A: 1994 and 1998)

b) How many people received food stamps in 1996? (A: 26 million)

## Polynomial Equations and Their Applications

**1.** James Bond stands on top of a 240-foot building and throws a film canister upward to a fellow agent in a helicopter 16 feet above the building. The height of the film above the ground *t* seconds later is given by the formula $h = -16t^2 + 32t + 240$ where *h* is in feet.

a) Calculate $h(0)$ and $h(1)$. What is their meaning in this context?

b) How long will it take the film canister to reach the agent in the helicopter? (A: 1 sec)

c) If the agent misses the canister, when will it pass James Bond on the way down? (A: 2 sec)

d) How long will it take to hit the ground? (A: 5 sec)

**2.** Textbook # 72 page 373. A rectangular parking lot has a length that is 3 yards greater than the width. The area of the parking lot is 180 square yards. Find the length and width. (A: 15 yd ;12 yd)

**3**. Textbook #78 page 374 As part of a landscaping project, you put in a flower bed measuring 20 feet by 30 feet. To finish off the project, you are putting in a uniform border of pine bark around the outside of the rectangular garden. You have enough pine bark to cover 336 square feet. How wide should the border be? (A: 3 ft)

**4.** Textbook #83 page 374

A tree is supported by a wire anchored in the ground 15 feet from its base. The wire is 4 feet longer than the height that it reaches on the tree. Find the length of the wire. (A: 30 1/8 ft)

**5.** The height , *h*, of a baseball *t* seconds after being hit is given by $h = -16t^2 + 64t + 4$. When will the baseball reach a height of 64? (A: 3/2, 5/2 sec)

**6.** A car traveling at 50 feet per second (about 34 mi per hour) can stop in 2.5 seconds after applying the brakes hard. The distance the car travels in feet, *t* seconds after applying the brakes is $d = 50t - 10t^2$. How long does it take the car to travel 40ft? (A: 1 second)