More problems for section 3.4 of *Essentials of Precalculus with Calculus Previews* by Zill and Dewar, 5e.

1. Find all zeros and factor completely.

a.	$x^3 - x^2 - 10x - 8$	b.	$4x^3 + 8x^2 - 15x - 9$	c.	$25x^3 - 85x^2 - 58x - 8$
d.	$3x^3 - 18x^2 + 15x + 36$	e.	$4x^3 - 4x^2 - x + 1$	f.	$3x^3 + 7x^2 - 22x - 8$
g.	$5x^4 + 16x^3 - 17x^2 - 64x - 12$	h.	$x^4 + 6x^3 + x^2 - 24x - 20$	i.	$x^4 - 5x^3 - 19x^2 + 29x + 42$
j.	$3x^4 - 8x^3 - 15x^2 + 32x + 12$	k.	$x^4 - 2x^3 - 7x^2 + 20x - 12$	l.	$x^4 + 5x^3 + x^2 - 21x - 18$
m.	$x^4 - 4x^3 - 3x^2 + 10x + 8$	n.	$x^4 + x^3 - 12x^2 + 4x + 16$	o.	$x^3 + 5x^2 + 5x - 2$
p.	$2x^3 - 4x^2 - 7x + 3$	q.	$2x^3 + 5x^2 - 7x + 2$	r.	$3x^3 + 4x^2 - 14x - 5$
s.	$x^4 + 3x^3 - 11x^2 - 23x + 6$	t.	$x^4 - 9x^2 + 14$	u.	$x^4 - 12x^2 + 27$
v.	$x^4 + 5x^3 - 4x^2 - 20x$	w.	$2x^4 + 5x^3 - 18x^2 - 26x - 8$	x.	$3x^4 + 10x^3 - 30x^2 + 10x + 7$
y.	$3x^3 + 4x^2 - 14x - 5$				

2. Find all zeros and factor completely.

a.	$x^2 + 4$	b.	$x^2 - 2x + 5$	c.	$x^2 + 4x + 7$
d.	$x^4 + x^3 + x^2 + 3x - 6$	e.	$2x^4 - x^3 + 7x^2 - 4x - 4$	f.	$3x^4 + 7x^3 - 7x^2 - 33x - 10$
g.	$2x^4 - 13x^2 - 13x - 6$	h.	$x^4 + 5x^2 + 4$	i.	$x^4 + 2x^2 - 15$
j.	$x^4 + 2x^3 + x^2 - 8x - 20$	k.	$x^4 - 15x^2 - 44x - 30$	l.	$x^4 - 81$

Answers

1a. $(x+1)(x+2)(x-4); x = -1, -2, 4.$ 1b. $(2x+1)(2x-3)(x+3); x = -1/2, 3/2, -3.$ 1c. $(5x+1)(5x+2)(x-4); x = -1/5, -2/5, 4.$ 1d. (factor out 3) $3(x+1)(x-3)(x-4); x = -1, 3, 4.$ 1e. $(x-1)(2x+1)(2x-1); x = 1, \pm 1/2.$ 1f. $(3x+1)(x-2)(x+4); x = -1/3, 2, -4.$ 1g. $(5x+1)(x+3)(x-2)(x+2); x = -1/5, -3, \pm 2.$ 1h. $(x+1)(x+5)(x-2)(x+2); x = -1, -5, \pm 2.$ 1i. $(x+1)(x+3)(x-2)(x-7); x = -1, -3, 2, 7.$ 1j. $(3x+1)(x-3)(x-2)(x+2); x = -1/3, 3, \pm 2.$ 1k. $(x-1)(x-2)^2(x+3); x = 1, 2, -3.$ 1l. $(x+1)(x-2)(x+3)^2; x = -1, 2, -3.$ 1m. $(x+1)^2(x-2)(x-4); x = -1, 2, 4.$ 1n. $(x+1)(x-2)^2(x+4); x = -1, 2, -4.$ 1o. $(x+2)(x-\frac{-3+\sqrt{13}}{2})(x-\frac{-3-\sqrt{13}}{2}); x = -2, (-3 \pm \sqrt{13})/2.$ 1p. $(x-3)(x-\frac{-1+\sqrt{3}}{2})(x-\frac{-1-\sqrt{3}}{2}); x = 3, (-1 \pm \sqrt{3})/2.$ 1q. $(2x-1)(x-\frac{-3+\sqrt{17}}{2})(x-\frac{-3-\sqrt{17}}{2})x = 1/2, (-3 \pm \sqrt{17})/2.$ 1r. $(3x+1)(x+(1-\sqrt{21})/2)(x+(1+\sqrt{21})/2); x = -1/3, (-1 \pm \sqrt{21})/2.$ 1s. $(x+2)(x-3)(x+2-\sqrt{5})(x+2+\sqrt{5}); x = -2, 3, -2 \pm \sqrt{5}.$ 1t. $(x-\sqrt{2})(x+\sqrt{2})(x-\sqrt{7})(x+\sqrt{7}); x = \pm\sqrt{2}, \pm\sqrt{7}.$ 1u. $(x-3)(x+3)(x-\sqrt{3})(x+\sqrt{3}); x = \pm\sqrt{3}, \pm 3.$ 1v. $x(x-2)(x+2)(x+5); x = 0, \pm 2, -5.$ 1w. $(2x+1)(x+4)(x-1-\sqrt{3})(x-1+\sqrt{3}); x = -1/2, -4, 1 \pm \sqrt{3}.$ 1x. $(3x+1)(x-1)(x+2-\sqrt{11})(x+2+\sqrt{11}); x = -1/3, 1, -2 \pm \sqrt{11}.$ 1y. $(3x+1)(x+\frac{1+\sqrt{21}}{2})(x+\frac{1-\sqrt{21}}{2})x = -1/3, (-1 \pm \sqrt{21})/2.$ 2a. $(x-2i)(x+2i); x = \pm 2i$ 2b. $(x-1-2i))(x-1+2i); x = 1 \pm 2i$ 2c. $(x+2-i\sqrt{3})(x+2+i\sqrt{3}); x = -2 \pm i\sqrt{3}$ 2d. $(x-1)(x+2)(x+i\sqrt{3})(x-i\sqrt{3}); x = 1, -2, \pm i\sqrt{3}$ 2e. $(x-1)(2x+1)(x-2i)(x+2i); x = 1, -1/2, \pm 2i$ 2f. $(x-2)(3x+1)(x+2-i)(x+2+i); x = 2, -1/3, -2 \pm i$ 2g. $2(x+2)(x-3)(x+(1-i)/2)(x+(1+i)/2); x = -2, 3, (-1 \pm i)/2$ 2h. $(x-i)(x+i)(x-2i)(x+2i); x = \pm i, \pm 2i$ 2i. $(x-\sqrt{3})(x+\sqrt{3})(x-i\sqrt{5})(x+i\sqrt{5}); x = \pm\sqrt{3}, \pm i\sqrt{5}$ 2j. $(x+2)(x-2)(x+1-2i)(x+1+2i); x = \pm 2, -1 \pm 2i$ 2k. $(x+1)(x-5)(x+2+i\sqrt{2})(x+2-i\sqrt{2}); x = 5, -1, -2 \pm i\sqrt{2}$ 2l. $(x-3)(x+3)(x-3i)(x+3i); x = \pm 3, \pm 3i$