PRECALCULUS - UNIT 2 QUEST REVIEW ANSWERS

① $f(x)=-3x^2+6x-5$

a) vertex: $x=\frac{-b}{2a}=\frac{-6}{2(-3)}=1$ $\boxed{(1,-2)}$

$f(1)=-3(1)^2+6(1)-5=-2$

b) x-intercepts:

$x=\frac{-6\pm\sqrt{36-4(-3)(-5)}}{2(-3)}$

$x=\frac{-6\pm\sqrt{-24}}{-6}$ ← imaginary

$\boxed{\text{no x-intercepts}}$

c) y-intercept: $f(0)=-3(0)^2+6(0)-5$

$\boxed{(0,-5)}$

② $f(x)=-2(x+5)^2+10$

a) vertex: $\boxed{(-5,10)}$

b) x-intercepts: $-2(x+5)^2+10=0$

$-2(x+5)^2=-10$

$\sqrt{(x+5)^2}=\sqrt{5}$

$x+5=\pm\sqrt{5}$

$x=-5\pm\sqrt{5}$

$\boxed{\begin{array}{l} x=-5+\sqrt{5} \\ x=-5-\sqrt{5} \end{array}}$

c) y-intercept:

$f(0)=-2(0+5)^2+10$

$=-40$

$\boxed{(0,-40)}$

③ $h(t)=-16t^2+64t+3.5$ max = vertex

$x=\frac{-b}{2a}=\frac{-64}{2(-16)}=\boxed{2 \text{ seconds}}$ ← when it reaches max height

$h(2)=-16(2)^2+64(2)+3.5=\boxed{67.5 \text{ ft.}}$ ← max height

④ $C=.01x^2-90x+15{,}000$

$x=\frac{-b}{2a}=\frac{90}{2(.01)}=\boxed{4500 \text{ units}}$

⑤ ↑ ↓ The degree is odd (5) and the leading coefficient is negative (-3).

⑥ $f(x)=8x^3+125$

$\boxed{(2x+5)(4x^2-10x+25)}$

⑦ $f(x)=x^5-5x^3+4x=0$

$x(x^4-5x^2+4)$

$x(x^2-4)(x^2-1)=0$

$\boxed{x=0}$ $x^2-4=0$ $x^2-1=0$

$x^2=4$ $x^2=1$

$\boxed{x=\pm 2}$ $\boxed{x=\pm 1}$

⑧

$$\begin{array}{r|l} & \boxed{2x^2+3x-5} \\ \hline x^2+2x-1 & 2\cancel{x^4}+7x^3-x^2-13x+5 \\ & -\ \cancel{2x^4}+4x^3-2x^2 \\ \hline & 3\cancel{x^3}+x^2-13x \\ & -\ \cancel{3x^3}+6x^2-3x \\ \hline & -5x^2-10x+5 \\ & -\ -5x^2-10x+5 \\ \hline & 0 \end{array}$$

⑨ $f(x)=x^3-19x-30$

Rational Root Test → $\frac{\pm 1,2,3,5,6,10,15,30}{1}$

Rule of Signs: + real zeros: 1

− real zeros: 2 or 0

$$\begin{array}{r|rrrr} 5 & 1 & 0 & -19 & -30 \\ & & 5 & 25 & 30 \\ \hline & 1 & 5 & 6 & \vert\, 0 \end{array}$$

$x^2+5x+6=0$

$(x+2)(x+3)=0$

$\boxed{x=5}$ $\boxed{x=-2}$ $\boxed{x=-3}$

⑩ $f(x)=x^4+x^3-8x^2-9x-9$

Rational Root Test: $\frac{\pm 1,3,9}{1}$

Rule of Signs: + real zeros: 1

− real zeros: 3 OR 1

$$\begin{array}{r|rrrrr} 3 & 1 & 1 & -8 & -9 & -9 \\ & & 3 & 12 & 12 & 9 \\ \hline & 1 & 4 & 4 & 3 & \vert\, 0 \end{array}$$

x^3+4x^2+4x+3 ← This doesn't group, so find a second zero from the list

$$\begin{array}{r|rrrr} -3 & 1 & 4 & 4 & 3 \\ & & -3 & -3 & -3 \\ \hline & 1 & 1 & 1 & \vert\, 0 \end{array}$$

x^2+x+1

$x^2+x+1=0$

$x=\frac{-1\pm\sqrt{1-4(1)(1)}}{2(1)}=\frac{-1\pm\sqrt{-3}}{2}=\boxed{\frac{-1\pm i\sqrt{3}}{2}}$

$\boxed{x=3,\ x=-3}$

⑪ $f(x)=x^4+x^3+3x^2+5x-10$

$\boxed{\begin{matrix} x=\sqrt{5}i \\ x=-\sqrt{5}i \end{matrix}}$

$(x-\sqrt{5}i)(x+\sqrt{5}i)$

$=x^2-\sqrt{5}ix+\sqrt{5}ix-5i^2$

$=x^2+5$

$$\begin{array}{r} x^2+x-2 \\ x^2+5\ \overline{)\,x^4+x^3+3x^2+5x-10} \\ \underline{-x^4\qquad\quad +5x^2\qquad\qquad} \\ x^3-2x^2+5x\qquad \\ \underline{-x^3\qquad\quad +5x\qquad} \\ -2x^2-10 \\ \underline{-2x^2-10} \\ 0 \end{array}$$

$(x^2+x-2)=0$

$(x+2)(x-1)=0$

$\boxed{x=-2}$ $\boxed{x=1}$

⑫ $(7-5i)(-4+3i)$

$=-28+21i+20i-15i^2$

$=\boxed{-13+41i}$

⑬ $\frac{(2+7i)}{(1+i)}\cdot\frac{(1-i)}{(1-i)}=\frac{2-2i+7i\overset{+7}{-7i^2}}{1\cancel{-i}\cancel{+i}\underset{+1}{-i^2}}=\frac{9+5i}{2}=\boxed{\frac{9}{2}+\frac{5}{2}i}$

⑭ $x=2$ $x=3$ $x=i$ $x=-i$ ← this isn't listed but has to be a zero because imaginary zeros come in pairs

$(x-2)(x-3)(x-i)(x+i)$

$(x^2-5x+6)(x^2+1)$

$x^4+x^2-5x^3-5x+6x^2+6=\boxed{x^4-5x^3+7x^2\mp 5x+6}$

⑮ Multiplicity is the number of times a root occurs. When the multiplicity is odd, the graph passes through the x-axis at that x-intercept. When the multiplicity is even, the graph bounces on the x-axis at that x-intercept.

See above for #15