Chapter 2 – Polynomial Functions

1.) If $P(x) = -4x^2+5x-1$, use synthetic substitution to find

a.) $P(-2)$ b.) $P(1/3)$ c.) $P(i)$

$-2 \,|\, -4 \;\; 5 \;\; -1$ / $8 \;\; -26$ / $-4 \;\; 13 \;\; \boxed{-27}$

$1/3 \,|\, -4 \;\; 5 \;\; -1$ / $-4/3 \;\; 11/9$ / $-4 \;\; 11/3 \;\; \boxed{2/9}$

$i \,|\, -4 \;\; 5 \;\; -1$ / $-4i \;\; 5i-4i^2$ / $-4 \;\; 5-4i \;\; -1+5i-4i^2$

$-1+5i+4$

$\boxed{3+5i}$

2.) One root of $3x^3-5x^2-3x+2 = 0$ is 2. Find the remaining roots.

$2 \,|\, 3 \;\; -5 \;\; -3 \;\; 2$ / $6 \;\; 2 \;\; -2$ / $3 \;\; 1 \;\; -1 \;\; \boxed{0}$

$3x^2+x-1=0$

$x = \frac{-1 \pm \sqrt{1^2-4(3)(-1)}}{2(3)} = \frac{-1 \pm \sqrt{13}}{6}$

3.) Let $P(x) = 8x^3 - 6x - 1$,

a.) Use synthetic division to find the quotient and remainder when $P(x)$ is divided by $x-.5$

$5 \,|\, 8 \;\; 0 \;\; -6 \;\; -1$ / $40 \;\; 200 \;\; 970$ / $8 \;\; 40 \;\; 194 \;\; \boxed{969}$

Q $8x^2+40x+194$

R 969

b.) List all possible rational roots of the equation $P(x) = 0$

$\frac{\text{Factors } 1}{\text{Factors } 8}$ $\frac{\pm 1}{\pm 1 \pm 2 \pm 4 \pm 8} \Rightarrow \pm 1 \;\; \pm\frac{1}{2} \;\; \pm\frac{1}{4} \;\; \pm\frac{1}{8}$

c.) Is $x-1$ a factor of $P(x)$?

$1 \,|\, 8 \;\; 0 \;\; -6 \;\; -1$ / $8 \;\; 8 \;\; 2$ / $8 \;\; 8 \;\; 2 \;\; \boxed{1}$

No remainder isn't = 0

4.) Sketch the graph of $P(x) = -x(x+2)(x-1)^2$

degree = 4 $a<0$

5.) Let $P(x) = x^4 + 2x^3 + x^2 + 8x - 12$

a.) Find the quotient and remainder when $P(x)$ is divided by $x+2$

$-2 \,|\, 1 \;\; 2 \;\; 1 \;\; 8 \;\; -12$ / $-2 \;\; 0 \;\; -2 \;\; -12$ / $1 \;\; 0 \;\; 1 \;\; 6 \;\; \boxed{-24}$

Q: x^3+x+6

R: -24

b.) Show that x-1 is a factor of $P(x)$.

$1 \,|\, 1 \;\; 2 \;\; 1 \;\; 8 \;\; -12$ / $1 \;\; 3 \;\; 4 \;\; 12$ / $1 \;\; 3 \;\; 4 \;\; 12 \;\; 0$ remainder = 0

c.) Find all the rational zeros.

$-3 \,|\, 1 \;\; 3 \;\; 4 \;\; 12$ / $-3 \;\; 0 \;\; -12$ / $1 \;\; 0 \;\; 4 \;\; 0$

$x^2+4=0$ $x^2=-4$

$\boxed{x = \pm 2i, \; -3, \; 1}$

d.) Find $P(i)$

$i \,|\, 1 \;\; 2 \;\; 1 \;\; 8 \;\; -12$ / $i \;\; 2i+i^2 \;\; 2i^2 \;\; 6i$ / $1 \;\; 2+i \;\; 2i \;\; 6 \;\; \boxed{-12+6i}$

e.) Solve $P(x) = 0$ giving all imaginary and real roots.

6.) Show that $x^3 + 2x^2 + 4 = 0$ has no rational root but does have an irrational root. Then approximate ... the nearest tenth

$P(-3) = -27+18+4$ (neg)

Chapter 4 Functions

1.) Give the domain of each function

a.) $f(x) = \dfrac{x-1}{x^2-4x+3}$

$f(x) = \dfrac{x-1}{(x-3)(x-1)}$ D: {x | x ≠ 3, 1}

b.) $f(x) = \sqrt{x^2-4}$

D: {x | x ≥ 2 or x ≤ -2}

$h(x) = x^2 - 3$ $g(x) = 7x - 2$

2.) Let f(x) = $x^2 + 6x + 5$. Find each of the following.

a.) (f+h)(x)

$f(x) + h(x)$

$x^2 + 6x + 5 + x^2 - 3$

$2x^2 + 6x + 2$

b.) g–1(x)

$g^{-1}(x)$

$x = 7y - 2$

$\frac{x+2}{7} = g^{-1}(x)$

c.) $(f \circ g)(x)$

$f(g(x))$

$f(7x-2)$

$(7x-2)^2 + 6(7x-2) + 5$

$49x^2 + -28x + 4 + 42x - 12 - 5$

$49x^2 + 14x - 13$

3.) Let f(x) = $2x^2 - x^4$.

$x^2(2-x^2)$

a.) Find the domain, range and zeros of the function.

D: {x | x ∈ ℝ}

R: {y | y ≤ 1}

zeros $x = \pm\sqrt{2}$, 0 (dr)

b.) Describe the graph of x = f(y). Does x = f(y) represent a function?

reflects over line y = x

no fails the vertical line test (newgraph) original fails horizontal line test

(x values are not unique)

4.) When a ball is thrown upward, itsapproximate height in meters t seconds later is given by h(t) = 36 + 24t – $5t^2$. Find the domain, range and zeros of h.

Domain {t | 0 ≤ t ≤ 6}

Rang {h(t) | 0 ≤ h(t) ≤ 64.8}

$0 = -5t^2 + 24t + 36$

$t = \dfrac{-24 \pm \sqrt{24^2 - 4(-5)(36)}}{2(-5)} = \dfrac{-24 \pm \sqrt{1296}}{-10} = \dfrac{-24 \pm -36}{-10} = 6$ or -1.2

zeros ↗

rang $V_t = \frac{-24}{2(-5)} = 2.$

$V_h = 64.8$ m

5.) Let f(x) = .5x – 5. Find $f^{-1}(x)$ and show that $(f \circ f^{-1})(x) = (f^{-1} \circ f)(x)$.

$y = \frac{1}{2}x - 5$

$x = \frac{1}{2}y - 5$

$x + 5 = \frac{1}{2}y$

$2x + 10 = f^{-1}(x)$

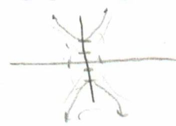
$f(2x+10) = \frac{1}{2}(2x+10) - 5 = x$

$f^{-1}(\frac{1}{2}x - 5) = 2(\frac{1}{2}x - 5) + 10 = x$

6.) Describe the graph of $y^2 - 4x^2 = 4$. Then tell if the graph has symmetry in the (a) x-axis,, (b) y-axis, (c) the line y=x, and/or (d) the origin.

$y^2 = 4x^2 + 4$

hyperbola $\frac{y^2}{4} - \frac{x^2}{1} = 1$



x-axis $(x, y) \rightarrow (x, -y)$

$(-y)^2 - 4x^2 = 4$ ✓

y-axis $(x, y) \rightarrow (-x, y)$

$y^2 - 4(-x)^2 = 4$ ✓

y = x $(x, y) \rightarrow (y, x)$

$x^2 - 4y^2 = 4$ ✗

origin $(x, y) \rightarrow (-x, -y)$

Chapter 7/8 Trigonometric Functions and Equations

1.) Name two angles, one positive and one negative, that are coterminal with the given angle.

a.) 110° $110-360=-250°$, $470°$

b.) 2.3 $2.3-2\pi=-3.98$, $2.3+2\pi=8.58$

2.) Given sinx = 0.6 and cosx<0, find the value of the following without using a calculator.

a.) cosx $= \frac{-8}{10} = \frac{-4}{5}$

b.) tanx $= -\frac{6}{8} = \frac{-3}{4}$

3.) Find the exact value of the expression.

a.) sin270° $= -1$

b.) cos300° $= \frac{1}{2}$

c.) sin-1(0.5) $=$ 60° or 120°

d.) tan-1(–1)   135° 315°

4.) If angle A is obtuse and cosA = (–1/3), find sinA and tanA.

$\sin A = \frac{\sqrt{8}}{3} = \frac{2\sqrt{2}}{3}$ $\tan A = -\sqrt{8} = -2\sqrt{2}$

5.) Solve 0°≤x<360°, Give answers to the nearest tenth of a degree.

a.) 4tanx –1 = 0

$\tan x = 1/4$

$x = 14°$ or $194°$

b.) sinxcosx = sinx

$\sin x(\cos x - 1) = 0$

$\sin x = 0$ $\cos x = 1$

180°   0, 360°

c.) (2sinx–1)(3cosx–1) = 0

$\sin x = 1/2$ $\cos x = 1/3$

30° 150°   70.5° 289.5°

d.) 2sin2x = 3(1–cosx)

0, 180

6.) Give the amplitude and period of each function.

a.) y = 1.5sin2x

$A = 1.5$

$\frac{2\pi}{p} = 2$ $p = \pi$

b.) y = 2–3cosπx

$A = 3$ (always +)

$\frac{2\pi}{p} = \pi$ $p = 2$

7.) Simplify

a.) $\dfrac{\cot x + \tan x}{\tan x}$

$$\frac{\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x}}{\frac{\sin x}{\cos x}} = \frac{\overset{1}{\cos^2 x + \sin^2 x}}{\sin x \cos x} \cdot \frac{\cos x}{\sin x} = \frac{1}{\sin^2 x} = \csc^2 x$$

b.) (cos2x)/(1-sinx) $\dfrac{1-2\sin^2 x}{1-\sin x}$

8.) Find the area of ΔABC if a = 10, b=17 ∠C=100°.

$\text{area} = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(10)(17)\sin 100$

$= 83.7\ \text{un}^2$

9.) Two ships leave port at 2 PM. One travels due east at 20 knots and the other on a course of 200° at 30 knots.

a.) How far apart are the ships at 4 PM?

$c^2 = 60^2 + 40^2 - 2(60)(40)\cos 110$

$c^2 = 6841.7$

$= 82.7$ nautical miles

?? b.) ~~Where will they meet at midnight~~? ??