MHF 4U FINAL EXAM REVIEW (SAMPLER)

Section A – RATES of CHANGE

(1) Determine the average rate of change for the following function:

$f(x) = -3x^5 + 2x^3 - 4$

$-2 \le x \le 1$

(2) Determine the average rate of change for the following function:

$f(x) = 5x^3 - x^2 + 2x$

$x \in (3,4)$

(3) Determine the instantaneous rate of change using the centered interval method for the following function:

$f(x) = -3x^3 + 2x^2 - 4$

$@x = -5$

(4) Determine the instantaneous rate of change using the difference quotient method for the following function:

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

$@x = 3$

Section B – POLYNOMIAL FUNCTIONS

(5) Determine the degree, the x-intercept(s), the y-intercept and end behaviours for each of the following polynomial functions

$g(x) = -x(2x+1)^2(x-1)^3(x+3)$

$h(x) = 6x^3 - x^2 - 4x - 1$

(6) Sketch each function from (5).

(7) When $f(x)=9x^2-mx+k$ is divided by $(x+4)$ the remainder is 164 and when it is divided by $(x-2)$ the remainder is 38. Determine the remainder when f(x) is divided by (x-1).

(8) Solve: $4x^6+4x^5=24x^4$

(9) Solve: $x^4-2x^3-13x^2+14x+24=0$

(10) Solve: $x^3+4x^2+x-6<0$

Section C – RATIONAL FUNCTIONS

(11) Determine all discontinuities (asymptotes and holes) for each of the following:

$$f(x) = \frac{x}{x^3 - x}$$

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

$$h(x) = \frac{x^3 + 5}{x^2 - 4x + 3}$$

(12) Determine the x-intercept(s) and y-intercept for f(x) and g(x).

(13) Sketch a graph of f(x) and g(x).

(14) Determine the point where h(x) crosses the asymptote.

(15) Solve: $\dfrac{x}{x-2} - \dfrac{3x}{x+1} = 5$

(16) Solve: $\dfrac{x-1}{x+3} \le \dfrac{3}{x-2}$

Section D – TRIGONOMETRIC FUNCTIONS

(17) Determine $\sec\left(\dfrac{-5\pi}{4}\right)$

(18) Determine exact primary trig ratios given that $\cot\theta = \dfrac{2}{5}$ **and the terminal arm is in Quad III. Also determine the measure of angle theta.**

(19) Determine $\cos\theta$ **given that the terminal arm passes through the point (4,-2). Also determine measure of angle theta.**

(20) Evaluate the exact trig ratio for $\sin\left(\dfrac{-5\pi}{12}\right)$

(21) Evaluate the exact trig ratio for $1 - 2\sin^2\left(\dfrac{7\pi}{8}\right)$

(22) The angle $\angle\theta$ lies in the second quadrant such that $\cos\theta = -\dfrac{11}{17}$**. Determine the exact value of** $\sin(2\theta)$**. Also determine the measure of** $\angle 2\theta$.

(23) Solve the following trigonometric equation for all real roots over the specified interval.

$3\cos x \sec x - 7\cos x = 0 \;,\; x \in [0, 2\pi]$

(24) Solve the following trigonometric equation for all real roots over the specified interval.

$-2\cos 2x = 4\sin x + 1 \;,\; x \in [0, 2\pi]$

Section E – EXPONENTIAL AND LOGARITHMIC FUNCTIONS

(25) Simplify: $\log 20 + \log 5$

(26) Simplify: $3\log_{16} 4$

(27) Simplify: $\log_3 12 - 2\log_3 2$

(28) Use log laws to express the following as a single log:

$3(\log_4 x - \log_4 y) + 2\log_4\left(\dfrac{3y}{x}\right)$

(29) Solve: $\log x - \log(x-1) = 2$

(30) Solve: $3^{2x} = 5^{x-1}$

ANSWERS

A (1) -27
(2) 180
(3) -245
(4) -4

B (5) degree 7, x-int 0,-1/2, 1, -3 , y-int 0
degree 3, x-int 1, -1/2, -1/3 , y-int -1
(7) 14
(8) 0,-3,2
(9) -1,2,4,-3
(10) $x \in (-\infty, -3)$
$x \in (-2, 1)$

C (11) f(x) horiz y=0, vert x=1, x=-1, hole (0-1)
g(x) horiz y=2, vert x=0 , hole (1,3)
h(x) oblique y=x+4, vert x=3, x=1
(12) f(x) (0,-1) and no x-intercept
g(x) no y-intercept and (-1/2 , 0)
(14) (7/13, 59/13)
(15) $\dfrac{6 \pm \sqrt{106}}{7}$ restrict $x \ne 2, x \ne -1$
(16) $x \in (-3, -1]$
$x \in (2, 7]$

D (17) $-\sqrt{2}$
(18) $\sin\theta = \dfrac{-5\sqrt{29}}{29}$ $\cos\theta = \dfrac{-2\sqrt{29}}{29}$ $\tan\theta = \dfrac{5}{2}$
angle theta = 4.33 rads
(19) $\cos\theta = \dfrac{2\sqrt{5}}{5}$ (20) $\dfrac{-\sqrt{6} - \sqrt{2}}{4}$
angle theta = 5.82 rads
(21) $\dfrac{\sqrt{2}}{2}$ (22) $\sin 2\theta = \dfrac{-44\sqrt{42}}{289}$ $2\theta = 4.55$ rads
(23) $x = \dfrac{\pi}{2}, \dfrac{3\pi}{2}, 1.13 rads, 5.16 rads$
(24) $x = \dfrac{7\pi}{6}, \dfrac{11\pi}{6}$

E (25) 2 (26) 3/2 (27) 1
(28) $\log_4\left(\dfrac{9x}{y}\right)$
(29) x=100/99 (30) x=-2.74