MHF4U – Final Exam Review (Fall 2017, Designed by Mr. Gugoiu)

**A Polynomial Functions**

Use the polynomial function $y = f(x) = x^3 + 2x^2 - x - 2$ to solve the following multiple choice questions.

**1.** The function $f(x)$ in factored form is:

A) $f(x) = (x-1)(x+1)(x-2)$ B) $f(x) = (x-2)(x+2)^2$ C) $f(x) = (x-1)(x+1)(x+2)$

D) $f(x) = (x-1)(x+2)^2$ E) $f(x) = (x-1)^2(x+2)$

**2.** The y-intercept is:

A) $y-\text{int} = -2$ B) $y-\text{int} = 0$ C) undefined D) $y-\text{int} = 2$ E) $y-\text{int} = 1$

**3.** The x-intercepts are:

A) $x-\text{int} = 1, \pm 2$ B) $x-\text{int} = \pm 1, -2$ C) $x-\text{int} = 1, -2$ D) $x-\text{int} = 1,2,3$ E) $x-\text{int} = 0, \pm 1$

**4.** The factor(s) of $f(x)$ is (are):

A) $x-1$ B) $x+1$ C) $x+2$ D) $x^2-1$ E) all of the left

**5.** When dividing $f(x)$ by $x-3$ the remainder is:

A) $-20$ B) $0$ C) $2$ D) $40$ E) $-2$

**6.** The average rate of change for the interval $0 \le x \le 1$ is:

A) $-4$ B) $4$ C) $-1$ D) $0$ E) $2$

**7.** The instantaneous rate of change at $x = 0$ is:

A) $4$ B) $3$ C) $-1$ D) $1$ E) $5$

**8.** The solution of the equation $f(x) = 12$ is:

A) $x = 2$ B) $x = 4$ C) $x = 1$ D) $x = 0$ E) $x = -2$

**9.** The solution set of the inequality $f(x) \ge 0$ is:

A) $[1, \infty)$ B) $[-2,-1] \cup [1, \infty)$ C) $[-2,-1]$ D) $(-2,-1) \cup (1, \infty)$ E) $[-2, \infty)$

**10.** As $x \to -\infty$, $y = f(x)$ approaches:

A) $-\infty$ B) $\infty$ C) $2$ D) $-2$ E) $0$

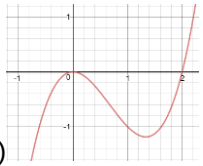
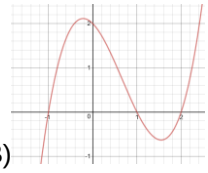
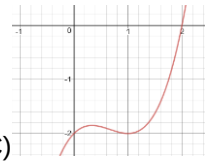
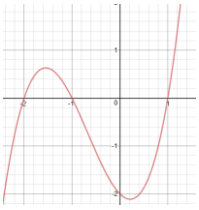
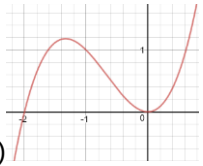
**11.** The number of turning points of the function $y = f(x)$ is:

A) $0$ B) $1$ C) $2$ D) $3$ E) $4$

**12.** The range of the function $y = f(x)$ is:

A) $(0, \infty)$ B) $(-\infty, \infty)$ C) $(0, \infty)$ D) $[0, \infty)$ E) $(-\infty, 0)$

**13.** The graph of the function $y = f(x)$ is:

A)  B)  C)  D)  E) 

Answers:

**1C 2A 3B 4E 5D 6E 7C 8A 9B 10A 11C 12B 13D**

**B Rational Functions**

Use the rational function $y = f(x) = \dfrac{2x-6}{2-x}$ to solve the following multiple choice questions.

**1.** The x-intercept is:
A) $x-\text{int} = 2$ B) $x-\text{int} = 3$ C) $x-\text{int} = 0$ D) $x-\text{int} = 1$ E) undefined

**2.** The y-intercept is:
A) $y-\text{int} = -3$ B) $y-\text{int} = 0$ C) undefined D) $y-\text{int} = 2$ E) $y-\text{int} = -1$

**3.** The equation of the horizontal asymptote is:
A) $y = -1$ B) $y = 3$ C) $y = -2$ D) $y = 0$ E) $y = -3$

**4.** The equation of the vertical asymptote is:
A) $x = -1$ B) $x = 1$ C) $x = -2$ D) $x = 0$ E) $x = 2$

**5.** The solution set of the inequality $f(x) \geq 0$ is:
A) $[3, \infty)$ B) $(2,3]$ C) $[0,2]$ D) $(1, \infty)$ E) $[2, \infty)$

**6.** The average rate of change for the interval $0 \leq x \leq 1$ is:
A) $-4$ B) $-3$ C) $1$ D) $0$ E) $-1$

**7.** The instantaneous rate of change at $x = 0$ is:
A) $-0.5$ B) $0$ C) $1$ D) $-2$ E) $4$

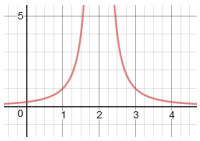
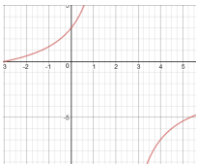
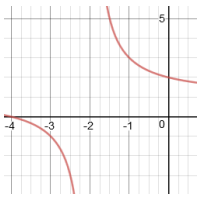
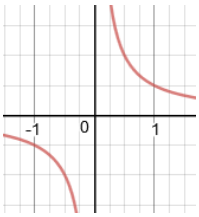
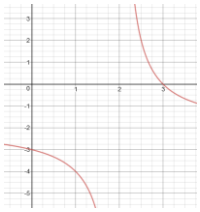
**8.** The solution of the equation $f(x) = -4$ is:
A) $x = 2$ B) $x = 4$ C) $x = 1$ D) $x = 0$ E) $x = -2$

**9.** The domain of the function $y = f(x)$ is:
A) $x \neq 0$ B) $x \neq 3$ C) $x \neq -2$ D) $x \neq -1$ E) $x \neq 2$

**10.** The range of the function $y = f(x)$ is:
A) $y \neq -3$ B) $y \neq 3$ C) $y \neq -1$ D) $y \neq -2$ E) $y \neq 0$

**11.** The composition $(f \circ g)(x)$ where $g(x) = \dfrac{2x+3}{x+1}$ is:
A) $(f \circ g)(x) = x$ B) $(f \circ g)(x) = x^2$ C) $(f \circ g)(x) = 2x$ D) $(f \circ g)(x) = -2x$ E) $(f \circ g)(x) = 1$

**12.** The graph of the function $y = f(x)$ is:

A) 
B) 
C) 
D) 
E) 

**13.** The function $y = f(x)$ is increasing over the interval:
A) $x \leq 0$ B) $0 < x < 1$ C) $1 \leq x < 2$ D) $2 < x \leq 3$ E) none of the left

**14.** As $x \to \infty$, $y = f(x)$ approaches:
A) $-3$ from above B) $-2$ from above C) $0$ from below D) $-2$ from below E) $0$ from above

**15.** The graph of function $y = f(x)$ is symmetric with respect to the point:
A) $(3,-2)$ B) $(3,-3)$ C) $(2,-2)$ D) $(0,0)$ E) $(1,2)$

Answers:
**1B 2A 3C 4E 5B 6E 7A 8C 9E 10D 11C 12E 13E 14B 15 C**

**C Trigonometric Functions**

Use the trigonometric function $y = f(x) = 4\sin(x/3) - 2$ to solve the following multiple choice questions.

**1.** The amplitude of the function $y = f(x)$ is:

A) $A = 0$ B) $A = 1$ C) $A = 3$ D) $A = 2$ E) $A = 4$

**2.** The phase shift of the function $y = f(x)$ is:

A) $PS = 0$ B) $PS = \pi/2$ C) $PS = -\pi/2$ D) $PS = \pi$ E) $PS = -\pi$

**3.** The period of the function $y = f(x)$ is:

A) $T = \pi$ B) $T = 2\pi$ C) $T = 3\pi$ D) $T = 6\pi$ E) $T = 5\pi$

**4.** The equation of the axis is:

A) $y = 1$ B) $y = -2$ C) $y = -1$ D) $y = 2$ E) $y = 3$

**5.** The y-intercept is:

A) $y - \text{int} = -3$ B) $y - \text{int} = 0$ C) $y - \text{int} = -2$ D) $y - \text{int} = 2$ E) $y - \text{int} = -1$

**6.** The x-intercept(s) in the interval $0 \le x \le 2\pi$ :

A) $x - \text{int} = \pi$ B) $x - \text{int} = 0$ C) $x - \text{int} = \pi/2$ D) $x - \text{int} = 3\pi/2$ E) $x - \text{int} = 1$

**7.** The solution of the equation $f(x) = 2$ in the interval $0 \le x \le 2\pi$ is:

A) $x = 0$ B) $x = \pi/2$ C) $x = \pi$ D) no solution E) $x = 3\pi/2$

**8.** The average rate of change for the interval $0 \le x \le \pi/2$ is:

A) $1/\pi$ B) $4/\pi$ C) $\pi/2$ D) $\pi/6$ E) $0$

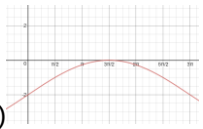
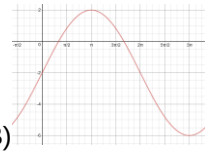
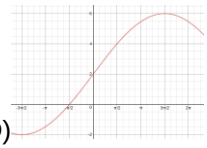
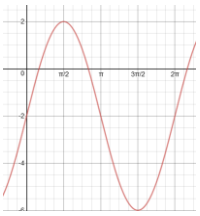
**9.** The instantaneous rate of change at $x = 0$ is approximate equal to:

A) $-0.33$ B) $-1$ C) $0.87$ D) $2.67$ E) $1.33$

**10.** The function $y = f(x)$ may be obtain from the function $y = \sin(x)$ and the following transformations, except:

A) vertical stretch by 4 B) horizontal stretch by 3 C) vertical shift down by 2
D) horizontal compression by 1/3 E) horizontal shift by 0

**11.** The graph of the function $y = f(x)$ is:

A)  B)  C)  D)  E) 

**12.** As $x \to \infty$, the value the function $y = f(x)$ approaches is:

A) $0$ B) $-2$ C) $4$ D) undefined E) $-4$

**13.** The value of the function $y = f(x)$ at $x = 2\pi$ is:

A) $2\sqrt{3} - 2$ B) $2\sqrt{3}$ C) $\sqrt{3}/2$ D) $\sqrt{3} + 2$ E) $\sqrt{2} - 2$

**14.** The minimum value of the function $y = f(x)$ is:

A) $y_{\min} = -4$ B) $y_{\min} = -6$ C) $y_{\min} = -2$ D) $y_{\min} = 0$ E) $y_{\min} = -1$

**15.** The maximum value of the function $y = f(x)$ is:

A) $y_{\max} = -4$ B) $y_{\max} = -2$ C) $y_{\max} = 0$ D) $y_{\max} = 1$ E) $y_{\max} = 2$

Answers:

**1E 2A 3D 4B 5C 6C 7E 8B 9E 10D 11B 12D 13A 14B 15E**

**D Logarithmic Functions**

Use the logarithmic function $y = f(x) = 1 - \log_2(x+1)$ to solve the following multiple choice questions.

**1.** The x-intercept is:
A) $x - \text{int} = -1$ B) $x - \text{int} = 1$ C) $x - \text{int} = 0$ D) $x - \text{int} = 2$ E) $x - \text{int} = -2$

**2.** The y-intercept is:
A) $y - \text{int} = 1$ B) $y - \text{int} = -1$ C) undefined D) $y - \text{int} = 2$ E) $y - \text{int} = 0$

**3.** The average rate of change for the interval $0 \le x \le 1$ is:
A) $-2$ B) $3$ C) $1$ D) $-1$ E) $0$

**4.** The instantaneous rate of change at $x = 0$ is approximate equal to:
A) $0.33$ B) $-0.34$ C) $-2.57$ D) $2.33$ E) $-1.44$

**5.** The domain of the function $y = f(x)$ is:
A) $x \le 0$ B) $x > 0$ C) $x > -1$ D) $x \ne 0$ E) $x \ge 1$

**6.** The range of the function $y = f(x)$ is:
A) $y \ne 0$ B) $(-\infty, \infty)$ C) $y > 0$ D) $y > 1$ E) $y < 1$

**7.** The equation of the horizontal asymptote is:
A) $y = 2$ B) $y = -1$ C) $y = 1$ D) undefined E) $y = 0$

**8.** The equation of the vertical asymptote is:
A) $x = -1$ B) $x = 1$ C) $x = 2$ D) $x = 0$ E) $x = -3$

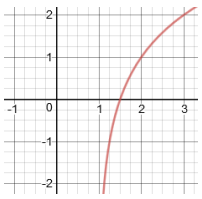
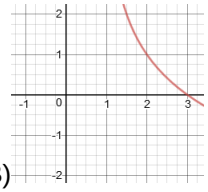
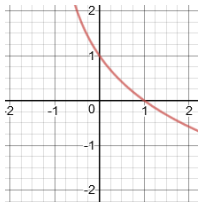
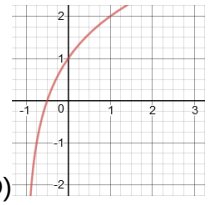
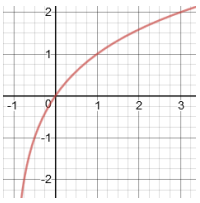
**9.** The solution of the equation $f(x) = 2$ is:
A) $x = 0$ B) $x = 3/2$ C) $x = 1$ D) $x = 1/2$ E) $x = -1/2$

**10.** The inverse function of the function $y = f(x)$ is the function:
A) $f^{-1}(x) = 2^{1-x}$ B) $f^{-1}(x) = 2^{1-x} - 1$ C) $f^{-1}(x) = 2^{-x} - 1$ D) $f^{-1}(x) = 2^{x-1} - 1$ E) $f^{-1}(x) = 2^{x-1} + 1$

**11.** The function $y = f(x)$ may be obtain from the function $y = \log_2 x$ and the following transformations, except:
A) vertical stretch by 1 B) horizontal stretch by 2 C) vertical shift up by 1
D) reflection in the x-axis E) horizontal shift left by 1

**12.** The composition $(f \circ f^{-1})(x)$ of the function $f(x)$ and its inverse $f^{-1}(x)$ is:
A) $(f \circ f^{-1})(x) = 1$ B) $(f \circ f^{-1})(x) = x^2$ C) $(f \circ f^{-1})(x) = 1/x$ D) $(f \circ f^{-1})(x) = -x$ E) $(f \circ f^{-1})(x) = x$

**13.** The graph of the function $y = f(x)$ is:

A)  B)  C)  D)  E) 

**14.** The function $y = f(x)$ may be written equivalently as:
A) $f(x) = \log_2 \dfrac{1}{x+1}$ B) $f(x) = \log_2 \dfrac{x}{x+1}$ C) $f(x) = \log_2 \dfrac{2x}{x+1}$ D) $f(x) = \log_2 \dfrac{2}{x+1}$ E) $f(x) = \log_2 \dfrac{x+1}{2}$

**15.** The slopes of the tangent line are:
A) negative and increasing B) negative and decreasing C) positive and increasing
D) positive and decreasing E) sometimes positive, sometimes negative

Answers:
**1B 2A 3D 4E 5C 6B 7D 8A 9E 10B 11B 12E 13C 14D 15A**

**E Combining Functions**

Let $f(x)=x^2$, $g(x)=2/(x-1)$, and $h(x)=\log_2(x+1)$.

**1.** The value of $(f+g)(2)$ is:

A) $0$ B) $2$ C) $4$ D) $6$ E) $8$

**2.** The value of $(g-h)(0)$ is:

A) $-2$ B) $2$ C) $-4$ D) $1$ E) $-3$

**3.** The value of $(fh)(1)$ is:

A) $-2$ B) $2$ C) $-4$ D) $1$ E) undefined

**4.** The value of $(g \div f)(0)$ is:

A) $1/2$ B) $-2$ C) $0$ D) undefined E) $4$

**5.** The value of $(f \circ g)(-1)$ is:

A) $2$ B) undefined C) $1$ D) $-1$ E) $5$

**6.** The value of $(h \circ g)(3)$ is:

A) $1$ B) $5$ C) $2$ D) $0$ E) undefined

**7.** The value of $(f \circ g \circ h)(0)$ is:

A) $1$ B) $2$ C) $3$ D) $4$ E) $5$

**8.** The function of $(h \circ f)(x)$ is:

A) $\log_2(x^2)$ B) $\log_2(x^2+1)$ C) $\log_2(x+1)^2$ D) $(\log_2(x+1))^2$ E) $\log_2(x^2-1)$

**9.** The function of $(f \circ g)(x)$ is:

A) $4/x^2$ B) $4/(x^2-1)$ C) $4/(x-1)^2$ D) $4/(x+1)^2$ E) $4/(x^2+1)$

**10.** The function of $(h \circ g)(x)$ is:

A) $\log_2(x^2+1)$ B) $\log_2\dfrac{x-1}{x+1}$ C) $\log_2\dfrac{x^2+1}{x^2-1}$ D) $\log_2\dfrac{x+1}{x-1}$ E) $\log_2\dfrac{x}{x-1}$

Match each graph to the correct function formula.

**11.** $y=f(x)$ .....

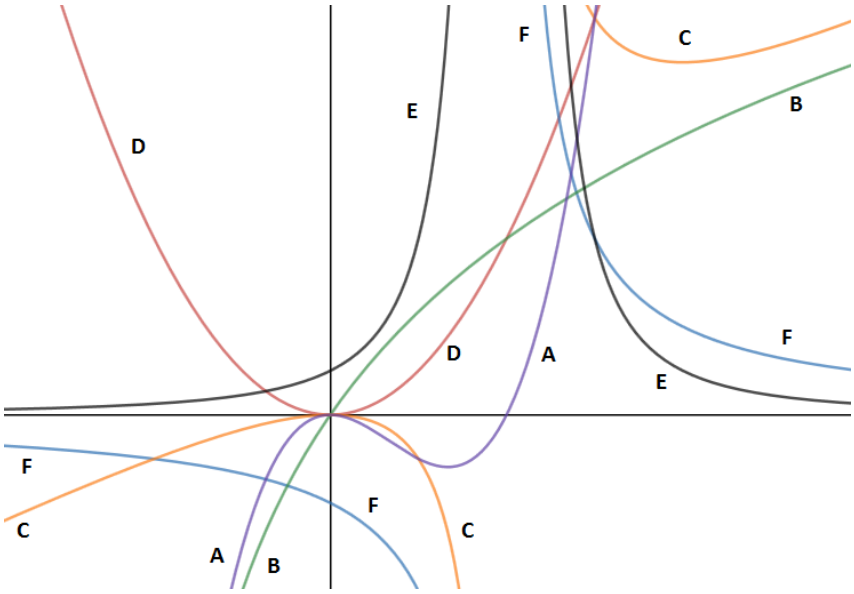
**12.** $y=g(x)$ .....

**13.** $y=h(x)$ .....

**14.** $y=(fg)(x)$ .....

**15.** $y=(f \div g)(x)$ .....

**16.** $y=(f \circ g)(x)$ .....




Answers: **1D 2A 3D 4D 5C 6A 7D 8B 9C 10D 11D 12F 13B 14C 15A 16E**