Math 1150
Autumn 2012

Midterm 1
Form A

Name: ______________________

OSU user name (name.nn): ______________________

Signature: ______________________

The point value of each problem is indicated. To obtain full credit you must have the correct answers along with **the supporting work**. Answers without supporting work will receive no credit, except for multiple choice problems. **CIRCLE YOUR ANSWERS**.

1. (20 points) Multiple Choice: **Circle your answer.**

(a) Evaluate $g(x)$ at $x = 6$.

$$g(x) = \begin{cases} \sqrt{x^2 - 4} & \text{if} \quad x \geq 3 \\ 2x & \text{if} \quad x < 3 \end{cases}$$

(i) 12 (ii) 4 (iii) $\sqrt{32}$ (iv) not listed

(b) The domain of the function defined by $f(x) = \dfrac{\sqrt{x+5}}{x-7}$ is:

(i) $(-\infty, 7) \cup (7, \infty)$ (ii) $[-5, \infty)$ (iii) $[-5, 7) \cup (7, \infty)$ (iv) not listed

(c) The range of the function defined by $g(x) = 2x^3 + 1;\ -2 \leq x \leq 3$ is:

(i) $[1, \infty]$ (ii) $[-15, 55]$ (iii) $[-2, 3]$ (iv) not listed

(d) For all functions f and g, the compostions $g \circ f$ and $f \circ g$ are always equal.

(i) true (ii) false

(e) The function f defined by $f(x) = (x-3)^2$; $x > 3$ is one to one.

(i) true (ii) false

2. (20 points) **Circle your answer** or **fill in the blank**.

(a) Compute $f \circ g(x)$ for $f(x) = \sqrt{x^2 - 1}$ and $g(x) = 3|x|$.

i) $3x - 1$ ii) $\sqrt{9x^2 - 1}$ iii) $\sqrt{3x^2 - 1}$ iv) not listed

(b) What is the domain of $\frac{f}{g}$, if $f(x) = 2x + 1$ and $g(x) = \frac{1}{3x}$?

i) $(-\infty, \infty)$ ii) all real numbers except 0

(c) Express the function $F(x) = \sqrt{2x - 1}$ in the form $f \circ g$.

$f(x) =$ ____________ $g(x) =$ ____________

(d) A function f is given, and the indicated transformations are applied to its graph in **the given order**. Circle the equation for the final transformed graph.

$f(x) = x^7$; shift 2 units to the left and reflect in the x-axis:

i) $-(x + 2)^7$ ii) $-x^7 + 2$ iii) $-(x - 2)^7$ iv) not listed

$f(x) = \sqrt[7]{x}$; stretch vertically by a factor of 3 and shift down 5 units:

i) $3(\sqrt[7]{x} - 5)$ ii) $3\sqrt[7]{x} - 5$ iii) not listed

3. (10 points) Let $P(x) = x^3 - 5.6x^2 + 6.79x$.

a) What is the end behaviour of P? **Fill in the blank**.

$y \longrightarrow$ __________ as $x \longrightarrow \infty$ and $y \longrightarrow$ __________ as $x \longrightarrow -\infty$

b) Use your graphing calculator to find the local maximum and minimum values of P correct to two decimal places. Use the viewing rectangle [-10, 10] by [-10, 10].

local maximum value(s) __________

local minimum value(s) __________

c) Find the interval(s) on which the function is increasing.

Interval(s) of increase: __________

4. (10 points) Find the inverse functionf^{-1} of $f(x) = \dfrac{1}{2+\sqrt{3+x}}$. Show your work.

$y =$ ______________________________

5. (20 points) Multiple choice. **Circle your answers** or **fill in the blank**.

(a) The vertex of the parabola given by the equation $y = 3x^2 - 12x + 9$ is:

(i) $(-2, 45)$ (ii) $(4, 9)$ (iii) $(2, -3)$ (iv) Not listed

(b) The graph of the inverse fuction f^{-1} is obtained from the graph of f by symmetry about:

(i) the x-axis (ii) the y-axis (iii) the line $y = x$

(c) The rational function $y = \dfrac{-6x^2 + 7}{(3x+1)(x-2)}$ has the following asymptotes. **Cicle all that apply and fill in the blank**.

(i) One vertical asymptote $x =$ ______

(ii) Two vertical asymptotes $x =$ ______ and $x =$ ______

(iii) One horizontal asymptote $y =$ ______

(iv) One slant asymptote $y =$ ______

(d) The average of the function $f(x) = x^3 + 5x$ between $x = 2$ and $x = 4$ is:

(i) 33 (ii) 51 (iii) 66 (iv) not listed

6. (12 points) Let $Q(x) = x^5 - x^3 - 12x$.

a) Factor Q completely into linear factors with complex coefficients.

b) Find all the zeros of Q, real and complex .

7. (8 points) Sketch a possible graph of a rational function with the properties:

(a) Domain $\{x \mid x \neq -2, x \neq 1\}$;

(b) three x-intercepts $(-3, 0); (0, 0); (2, 0)$, and one y- intercept $(0, 0)$;

(c) a slant asymptote $y = x$;

(d) two vertical asymptotes $x = -2$ and $x = 1$ such that:

$y \longrightarrow -\infty$ as $x \longrightarrow 1^+$ and $y \longrightarrow \infty$ as $x \longrightarrow 1^-$

$y \longrightarrow -\infty$ as $x \longrightarrow -2^+$ and $y \longrightarrow \infty$ as $x \longrightarrow -2^-$