UNIVERSITY OF NEW BRUNSWICK
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 0863-PRECALCULUS
Final Exam - December 2000

I. Simplify the following using laws of exponents and write your answer with no negative exponents:

4 a) $(x^{1/5}y^{6/5}z^{-2/5})^5$
b) $(x^{-1} - y^{-1})^{-2}$

II. Factor the following expressions:

a) $6y^2 - 4y$
b) $3x^2 - 3$
8 c) $x^2 - 13x + 30$
d) $6x^2 + x - 2$

III. Simplify the following rational expression:

3 $$\frac{x^2 - x - 6}{x^2 - 7x + 12}$$

IV. Solve the following equations:

a) $-3x + 9 = 0$
b) $|3x + 4| + 1 = 16$
10 c) $x^2 + 2x - 15 = 0$
d) $3x^2 + x = 2$
e) $9x^2 - 1 = -6x$

V. Rationalize the denominator in the following expressions:

a) $\frac{2}{\sqrt{5}}$

4 b) $\frac{\sqrt{2}}{\sqrt{3} \cdot \sqrt{6}}$

VI. Evaluate the following:

a) $16^{3/4}$
4 b) $81^{-1/2}$
c) $2^5 \times 2^3 \times 2^{-6}$
d) $8^2 \times 16^3 \times 4^{-9}$

VII. Expand and simplify the following expressions:

4 a) $(x - 4)(x + 3)$
b) $(x^2 - 2)(x^2 + 3x - 1)$

VIII. Solve the following inequalities using the method of your choice, express your answers using interval notation and graph your result:

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a) $2x + 3 \geq 5$

b) $x^2 - 5x + 5 \geq -1$

c) $\dfrac{x^2 - 7x + 10}{x^2 - 9} < 0$

4 IX. If a line passes through the points (1,2) and (-3,-2), find both the slope of the line and its equation.

3 X. For the lines $3x + y = 5$ and $3y = x + 9$, state whether they are parallel or perpendicular or neither and show your reasoning!

3 XI. For the function $y = 2x^2 - 8x + 7$, identify whether it has a maximum or minimum value and find that value.

XII. For the function $y = 3x^2 + x - 2$, identify the following:

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a) vertex

b) axis of symmetry

c) y-intercept

d) x-intercepts

e) sketch the function labelling all important points

3 XIII. Sketch the graph of $y = x$ and on the same set of axis sketch the graph of $y = x + 2$. Identify any important point!

XIV. If $f(x) = x^2 + 4x - 3$ and $g(x) = 2x + 1$, find

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a) $f(-1)$

b) $g(3)$

c) $f \circ g(x)$

XV. Solve:

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a) $3 - \sqrt{x^2 - 3x} = 1$

b) $(x^2 - 2x)^2 - 5(x^2 - 2x) = 6$

5 XVI. Graph the function $f(x) = 4 - x^2$ and state the domain and range of the function. Also indicate the y- intercept and x- intercepts.

XVII. A rocket is fired down a practice range. The height in meters after "t" seconds is given by

3

$$h = -1/4t^2 + 3t + 45$$

Find the maximum height attained by the rocket.

XVIII. The population of a town of 10,000 grows at the rate of 2% per year. Find the population of the town in three years time. (Leave your answer in exponential form)

XIX. (a) Express the log of the following in exponential form:

$\log_2 64 = 6$

(b) Knowing that log2 = 0.3010 and log9 = 0.9542, determine :

log2/9

(c) Solve the equation for x:

$\log(2x + 1) = \log(x + 6)$

XX. Convert the following to the desired measure:

a) $60° =$ _____ radians

b) $\pi/18 =$ _____ degrees

c) $450° =$ _____ radians

XXI. Using the unit circle find the following trigonometric functions:

a) sin 30°

b) cos 135°

c) tan 180°

d) sin 210°

e) cos 330°

XXII. Sketch the following graphs. For each pair use the same axis and label each graph clearly!

a) $y = \sin\theta$ and $y = 2\sin\theta + 1$

b) $y = \cos\theta$ and $y = \cos(\theta + 90°)$