Some Review Problems for the Math 150 Final (By Precious A.)

Note: The final is cumulative and covers all topics in the text HW, WebAssign HW, worksheets, quizzes, in-class tests, test reviews, etc. This list of problems is not intended to be comprehensive or to indicate the actual problems that will be on the exam. I suggest that you work through these problems, and when you encounter a difficult topic, you then refer to the textbook for extra practice with that topic (where you have an abundance of practice problems with answers). Remember to do these problems without a calculator!

I don't intend to create an answer key for this packet. You will, however, be presenting some of your solutions on the board in class during the review week, which will give us a chance to compare answers on some of the problems. We won't have time to go over all of the problems in class, of course. I suggest that you plan to attend as many of the below PLF study sessions as you can for extra help: (THESE ARE OPEN TO ANY MATH 150 STUDENTS! NO APP'T NEEDED!)

Sarah Wright
swright6@unm.edu
MW 9:00-9:50 AM DSH 317
Tues 8:00-9:00 AM DSH 318

Aaron D'Arezzo
aaron116@unm.edu
MWF 11-12 am at the Algebra table, 4-5 pm on Tuesdays in DSH 120

Ben Matheson
matheson@unm.edu
Tuesdays from 2-4 in DSH Lobby (near deli)

David Nelson (Appointments available with your schedule! Also quick questions via email!)
nelson38@unm.edu

Mike Lynam (121 tutor, but can help with most Math 150 also!)
mlynam09@unm.edu
MWF 1:00-1:50 AM DSH 318

Precious Andrew
prcs841@msn.com
Tuesdays 3:15-4:15 Algebra Table, Thursdays 3:15-4 DSH Lobby (near deli)

Also, don't forget there's the Algebra Table (most days 9-3 at least, schedule posted 2nd floor DSH near elevator) and CAPS (3rd floor Zimmerman, extensive hours).

1) Express the surface area A of a cube as a function of it volume V

2) Express the volume V of a cube as a function of it surface area A

3) For each, find the Difference Quotient (Make sure to simplify and that your h cancels!)

a) $g(x) = -3x^2 + 2x - 6$ b) $g(x) = \sqrt{x-3}$ c) $f(x) = \frac{2}{\sqrt{x}}$ d) $f(x) = \frac{-2}{x-1}$ e) $l(x) = \frac{x-3}{1-2x}$

4) For $f(x) = \sqrt{x-3}$

a) Find the Average Rate of Change from 4 to $7 + h$, where h is arbitrary

b) What value does the AROC approach as h approaches 0? (E.g. What's $\lim_{h\to 0} AROC$?)

5) For $f(x) = \frac{-3x}{x-2}$

a) Find the Average Rate of Change from 4 to $7 + h$, where h is arbitrary

b) What value does the AROC approach as h approaches 0? (E.g. What's $\lim_{h\to 0} AROC$?)

6) If you have 600m of fencing available and need to enclose the 5-sided field pictured, what dimensions maximize the total area and what's the maximum total area?

7) If you have 10,000ft of fencing available and need to enclose the 3-sided field pictured, what dimensions maximize the total area and what's the maximum total area?

8) For $g(x) = -2x^2 + 8x + 2$, find the vertex, all intercepts, the axis of symmetry, and the intervals of increase and decrease. Put the equation in transformation form by completing the square. Sketch a graph.

9) Find all asymptotes and/or holes. Identify each as a vertical/horizontal/slant asymptote or a hole. a) $R(x) = \frac{x^3-8x^2+10}{x^2+3x+2}$ b) $R(x) = \frac{2x^2-16x-40}{3x^2-12}$ c) $R(x) = \frac{5x-x^2}{4x-4}$ d) b) $R(x) = \frac{-3}{x+2} - 4$

10) For b, c, and d in #9), find all x and y-intercepts

11) Identify the real part and the imaginary part, after performing the operation:

a) $\frac{8-5i}{2i+3}$ b) $\frac{6i-1}{i+2} - (1 - 3i)$ c) $(-i)^{5007}$ d) $\frac{-2}{i+3} + \frac{i}{4-i}$

12) Find the polynomial of degree 4 with integer coefficients that has zeros $2 + i$ and 4, which touches at 4. Here, $P(-1) = -750$.

13) Graph a) $p(x) = -2x^5 + 37x^4 + 60x^3$ b) $P(x) = -(x-3)(x+1)^2(x+2)$, making sure to indicate the intercepts, end behavior, and maximum number of turns.

14) For each a) $p(x) = 3x^3 + 5x^2 + 10x - 4$ b) $p(x) = x^3 - 4x^2 - 13x + 6$

c) $p(x) = x^4 + 12x^2 + 36$ d) $p(x) = 16x^4 - 81$

e) $p(x) = x^4 - 6x^3 + 7x^2 - 6x - 20$ (For part e), assume $x = 1 - \sqrt{3}i$ is a zero)

i) List all possible RATIONAL zeros ii) Factor completely iii) List ALL zeros

15) The sum of two numbers is twice their difference. The larger number is 6 more than twice the smaller. Find the numbers. (Show your work, don't guess!)

16) A right triangle has area 6 sq. ft. and a hypotenuse 5 ft long. What are the lengths of the legs? (Show your work, don't guess!)

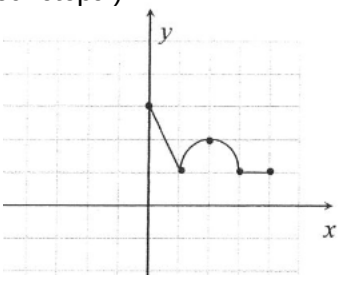
17) Solve (leave your answers in exact form): a) $e^x - 36e^{-x} = 16$ b) $\ln(3x + 2) = \ln(4x) + 2$

c) $4^{5x-1} = 6^{3-2x}$ d) $\log_6(x+3) = 1 - \log_6(x+4)$ e) $6^{2x} - 37 \cdot 6^x + 36 = 0$

f) $\frac{10}{1+e^{-x}} = 2$ g) $750 = \frac{250}{1-6e^{-0.1t}}$

18) Combine into a single logarithm (simplify your result): $5\ln(xw^3) - 6\ln(x) - \ln(w^9) + \ln\sqrt{p}$

19) Use the given graph of $f(x)$ to graph each by transformations (Explain your steps!)



a) $g(x) = -f(x+2) - 4$ b) $g(x) = 3f(-2x) + 1$

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

20) For each, find $f^{-1}(x)$, state the domains/ranges of both $f^{-1}(x)$ and $f(x)$

a) $f(x) = \frac{2x-7}{3x-1}$ b) $f(x) = -1 - e^{x-1}$ c) $f(x) = 5\ln\left(\frac{x}{2}\right) + 3$ d) $f(x) = 3\sqrt{x-1}$ (make sure you think about the *graph* for part d)

21) Graph $f(x) = -e^{x-4} + 1$ w/out a calculator. Label at least three points, find any intercepts and asymptotes.

22) Graph $f(x) = 2\ln(-x) - 3$ w/out a calculator. Label at least three points, find any intercepts and asymptotes.

23) For each, find $f \circ f, f \circ g, g \circ f, g \circ g$ and their domains

a) $f(x) = \frac{2+3x}{x+5}$, $g(x) = \frac{x+6}{x-1}$ b) $f(x) = \sqrt{x-5}$, $g(x) = \sqrt{x}$

24) Solve. Write your answer in interval or set-builder notation and sketch your solution on a number line: $\frac{5x-1}{x+1} < 3$ (see 1.7 notes for help)

25) Find the domain of each. Write your answer in interval or set-builder notation:

a) $f(x) = 6\sqrt{x-3} + \ln(5-x)$ b) $f(x) = \sqrt{\frac{3x-1}{5x+10}}$ c) $f(x) = \ln\left(\frac{1-2x}{x^2-9}\right)$

26) Sketch the curve represented by the parametric equations $x = \sqrt{t}, y = 2 - t$. Find a rectangular coordinate equation for the curve by eliminating the parameter.

27) Find parametric equations for a line passing through (5,-7) and the origin.

28) The function $H(t) = 10\sqrt{t}$ represents the height, in feet, of a hot air balloon after t seconds.

a) Find the average rate of change of $H(t)$ from $t = 1$ to $t = 9$ seconds. Interpret the result.
b) Find the average rate of change of $H(t)$ from $t = 4$ to $t = 4 + h$ seconds. (Make sure to simplify your result so that h cancels).
c) Call your answer to part b $f(h)$. Find $\lim_{h\to 0} f(h)$. Interpret this result.

29) Solve a) $\begin{cases} 3x^2 + 2y = 26 \\ 5x^2 + 7y = 3 \end{cases}$ b) $\begin{cases} x + y - z = 0 \\ x + 2y - 3z = -3 \\ 2x + 3y - 4z = -3 \end{cases}$ c) $\begin{cases} xy = 24 \\ 2x^2 - y^2 + 4 = 0 \end{cases}$

30) After 6 days, a sample of Bio-256 has decayed to 42% of its original amount.

a) What's the half-life or Bio-256? b) How long will it take the sample to decay to 15% of its original amount? c) Now assume there were 30 grams initially. How much is there in 100 days? d) Still assuming there were 30 grams initially, how long until there are 8 grams?

31) How long will it take an investment of $12,000 to grow to $16,000 at an annual interest rate of 9.5%, a) if compounded continuously? b) If compounded quarterly?

32) What interest rate is required for $12,000 to grow to $16,000 in 5 years, a) if compounded continuously? b) If compounded quarterly?

33) On the planet GreenOrb, an alien farmer has 1200 miles of land on which she'll grow BluGoo, PinkSlime, and PurplePutty. It costs \$45 per mile to grow BluGoo, \$60 to grow PinkSlime, and \$50 to grow PurplePutty. The alien will grow twice as many miles of PinkSlime as of BluGoo. She will spend \$63,750 to grow the crops. How many miles of each crop should she plant?

34) Suppose you'll invest \$50,000 in three types of accounts: a money market account which yields 5% interest, a stock account which yields 9% interest, and a government bond which yields 16% interest. Assuming you need \$4,000 in interest in the first year, and will invest three times as much in the money market account than in the government bonds, how much should be invested in each account?

35) Blossom, Bubbles, and Buttercup visit a bakery. Blossom orders two peanut butter cookies, one creampuff, and two cake donuts and pays \$6.25. Bubbles orders one peanut butter cookie and three cake donuts and pays \$3.75. Buttercup orders 3 peanut butter cookies, one creampuff, and 4 cake donuts and pays \$9.25. Find the price of each treat.

36) For $r(x) = \frac{3x^2-x-2}{2x^2-7x+5}$, find each limit, if it exists: a) $\lim_{x\to 0} r(x)$ b) $\lim_{x\to 1} r(x)$

c) $\lim_{x\to \frac{5}{2}} r(x)$ d) $\lim_{x\to \infty} r(x)$

37) Find each limit, if it exists: a) $\lim_{t\to 0} \frac{\sqrt{t^2+64}-8}{t^2}$ b) $\lim_{h\to 0} \frac{(3+h)^{-1}-3^{-1}}{h}$ c) $\lim_{x\to \infty} \sqrt[3]{\frac{27x^2-8}{1-x^2}}^2$

d) $\lim_{x\to 0} \sqrt[3]{\frac{27x^2-8}{1-x^2}}^2$ e) $\lim_{x\to 0} \frac{x}{|x|}$

38) Identify the following conic and find all related information, vertices, foci, asymptotes, etc and graph.

i. $9x^2 - 4y^2 = 36$
ii. $9x^2 + 4y^2 = 36$
iii. $8x^2 - 12y = 0$
iv. $9x - 4y^2 = 36$

39) Find the equation of the::

i. Parabola with focus (0,2) and vertex (0,0).
ii. Ellipse with foci $(\pm 4,0)$ and vertices $(\pm 5,0)$
iii. Ellipse with major axis of length 6, minor axis of length 2 and foci on the y-axis
iv. Hyperbola with vertices $(\pm 4,0)$ and foci $(\pm 5,0)$
v. Hyperbola with asymptotes $y = \pm\frac{1}{2}x$ and foci $(0,\pm 8)$