Math 103 Precalculus (Vinroot)

Midterm Review (Not to turn in)

Midterm Review Problems

These are problems to prepare for the Math 103 Midterm, which will be on Wednesday, October 28 during class. We can discuss any of these problems in class on Monday, October 26.

1. Find the equation of the line which is perpendicular to the line with equation $3y - 2x = 3$ and which goes through the point $(-1, 1)$. At what point do the line you found and the original line intersect? Sketch a rough graph.

2. Find all values of x such that $2x^2 - 7x + 3 \le 0$. Given your solution, what can you conclude about the values of x such that $2x^2 - 7x + 3 > 0$ (without doing another computation)? Use this information to sketch a rough graph of $y = 2x^2 - 7x + 3$.

3. A container is in the shape of an upside-down pyramid with a square base of edge length 2 ft and height 8 ft. The container is filled with liquid to a height of 4 ft. What is the volume of the liquid in the container?

4. A rectangle with one side length equal to 8 is inscribed in a circle of radius 5. What is the other side length of the rectangle? What is the area of the rectangle? What is the ratio of the perimeter of the rectangle to the circumference of the circle?

5. Solve for x in each of the following equations, or explain why there are no solutions if applicable:

(a): $3x^2 - 17x + 10 = 0$ **(b):** $x^2 + 4x + 1 = 0$, by completing the square.

(c): $x^2 + 2x + 6 = 0$ **(d):** $x^3 + x^2 - 7x + 5 = 0$ **(e):** $\log_3(x) + \log_3(x + 2) = 1$

(f): $\dfrac{x^2 - 3x + 7}{x^2 + 2x - 6} = 1$ **(g):** $\dfrac{1}{9} 3^{2x^2} = 27 \cdot 3^{1/9}$ **(h):** $A^2 x^{3/2} - P \ln(A^3 B) = My^3$

6. Find all values of x for which each of the expressions are undefined:

(a): $\log_5(7x - 9)$

(b): $\dfrac{14x^4 - 13}{x^3 + 7x^2 + 15x + 9}$

(c): $(-2x^2 + x + 3)^{1/10}$

(d): $(x^7 - 9x^6 + x^3 - 2x + 12)^{1/7}$

(e): $\dfrac{1}{\ln(x^2 + 2x - 3)}$

(f): $\ln(x + 4) + \ln(x - 2)$ (Don't combine the logarithms! Why not?)

7. A spherical water tank has radius 15 ft (so diameter 30 ft). The water level is at a height of 27 ft. What is the radius of the surface of the water inside of the tank?

8. Write each of the following rational expressions as a quotient plus a simplified rational expression:

(a): $\dfrac{x^5 + 3x^2 + 2}{x^2 + 1}$ **(b):** $\dfrac{5x^4 + 4x^3 + 3x^2 + 2x + 1}{x^3 + x + 1}$

9. (a): Write the following in the form $c \ln(x)$, for some number c: $2\ln(x^2) + \frac{1}{3}\ln(x) - \dfrac{\log_2(x^{1/2})}{\log_2 e}$.
(b): Write the following as a single power of 2: $(8^{-2/3}2^3(\frac{1}{16})^{-1/4}32^{3/5})^2$.

10. Evaluate each of the following (your final answer should be a number):
(a): $\log_3(\frac{1}{9})$ **(b):** $16^{3/4}$ **(c):** $47^{\log_{47}(4)}$
(d): $4^{1/4}8^{-3/2}$ **(e):** $\log_3(28^{8\ln 1})$ **(f):** $8^{\log_2(3)}$
(g): $\dfrac{\log_{11} \sqrt[5]{49}}{\log_{11} 7}$ **(h):** $\log_{1/10}(.001)$ **(i):** $\dfrac{\ln(17/5)}{\ln 3} \dfrac{2\log_7(\sqrt{3})}{\log_7(3.4)}$