Math 1120   **Calculus, Fall 2008**   **Final Exam**

Name _____

There are 210 points available on this test.

1. (10 points) The line tangent to the graph of a function f at the point $(2, 9)$ on the graph also goes through the point $(0, 7)$. What is $f'(2)$?

2. (10 points) Find an equation for the line tangent to the graph of $f(x) = x^2 - 3x$ at the point (2,-2)?

3. (10 points) Find an equation for the line tangent to the graph of $f(x) = \ln(2x + 1)$ at the point (0, 0)?

4. (10 points) Find an equation for the line tangent to the graph of $y = e^{(2x-1)}$ at the point on the graph where $x = 2$?

5. (10 points) Find the rate of change of $f(t) = e^{3t} \cdot \ln(t)$ when $t = 1$.

6. (10 points) Let $h(x) = \frac{\sqrt{(x-4)(x-2)(2x+7)}}{x^2-100}$. Write the domain of h in interval notation.

7. (20 points) Let $h(x) = \ln(x^2 + 4x + 5)$.

   (a) What is the domain of h. Recall that $\ln(x)$ is defined only if $x > 0$.

   (b) Build the sign chart for $h'(x)$.

   (c) Discuss the local max and min of h.

8. (15 points) A radioactive substance has a half-life of 22 years. Find an expression for the amount of the substance at time t if 20 grams were present initially.

9. (10 points) If $h = g \circ f$ and $f(1) = 3, g'(3) = 7, f'(1) = -2$ find $h'(1)$.

10. (15 points) Let $f(x) = x^4 + 2x^3 - 12x^2 + x - 5$.

    (a) Find the interval(s) where f is concave upward.

    (b) Find the inflection points of f, if there are any.

11. (15 points) Find the area of the region R bounded above by the graph of $f(x) = x^2 - 3x + 11$, below by the x-axis, and on the sides by the vertical lines $x = 0$ and $x = 2$.

12. (15 points) Find the area of the region R caught between the graph of $f(x) = x^2 - 3x + 2$ and $g(x) = -x + 5$.

13. (40 points)

(a) Evaluate $\int x^3 - x^{-2} + x^{-1} \ dx$

(b) Evaluate $\int_1^3 \frac{x^3 - 2x^2 + x}{x} \ dx$

(c) Evaluate $\int_0^7 \frac{d(x-5)^9}{dx} \ dx$

(d) Evaluate $\int_0^4 \frac{3x^2}{x^3+5} \ dx$

14. (20 points)

    (a) Find the sign chart for the function $g(x) = \frac{(2x-3)(3x+1)}{(x-4)(x+2)}$.

    (b) Find all the asymptotes of g.

    (c) Use the information in (a) and (b) to sketch the graph of g. Note: the graph must be consistent with (a) and (b) to get credit here.