Sample midterm 1, Math 16a, Spring 2009

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1. Find the points on the graph of $y = x^5 + 10$ where the tangent is perpendicular to the line $y = -x/5$.

2. Find
$$\lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9}$$

3. Find the derivative of
$$y = \left(x^5 + x^4 + x^3 + x^2 + x\right)^{17}$$
   at $x = -1$.

4. Find
$$\lim_{x \to 1} \frac{x^2 - 1}{x^2 - 2x + 1}$$

5. Find the equation of the line which is tangent to the curve
$$y = 3x^{1/3}$$
   at the point where $x = 27$.

6. Using the derivative, find an approximate value of $15^{1/4}$.

   Hint: $16^{1/4} = 2$.

7. Suppose $f(x) = |1 - x|^5$. Find $f'(x)$.

8. Compute the derivative of $f(x) = x^3$ at $x = 1$ using the definition of the derivative as a limit.

9. Suppose
$$f(x) = \frac{x^2 - 5x + 6}{x^2 - 4}$$
for $x \neq 2$ and that $f(2) = b$. Suppose $f(x)$ is differentiable at $x = 2$. Find b. Explain your reasoning.

10. Find the maximum value of
$$f(x) = (x^8/8) - (x^6/6)$$
on the interval $[-2, 1]$.

11. Find the maximum value of
$$f(x) = (x^4 + 2)^{-3}$$