STUDENT NAME:

Calculus 1550, section 6. Tuesday, March 10, 2004. Twelfth quiz.

Find the derivatives of the following functions. 2 points each.

1. $f(x) = \tan(x^2)$

$f'(x) = 2x \sec^2(x)$

(derivative of x^2; deriv of tan)

decomposition: $f(x) = \tan(y)$, $y = x^2$

(so $f'(x) = \sec^2(y) \times 2x$; make substitution $y = x^2$ for final answer)

2. $f(x) = \sqrt{(x^4 - 5x + 1)} = (x^4 - 5x + 1)^{1/2}$

$f'(x) = 1/2\,(x^4 - 5x + 1)^{-1/2} \times (4x^3 - 5) = \dfrac{4x^3 - 5}{2\sqrt{x^4 - 5x + 1}}$

decomposition: $f(x) = \sqrt{y}$, $y = x^4 - 5x + 1$

(so $f'(x) = 1/2\,(y)^{-1/2} \times (4x^3 - 5)$)

3. $f(x) = \sin(e^x)$

$f'(x) = e^x \cos(e^x)$

(decomposition: $f(x) = \sin(y)$, $y = e^x$; so $f'(x) = \cos(y) \times e^x$)

4. $f(x) = e^{\sin(x)}$

$f'(x) = \cos(x) \times e^{\sin(x)}$

(decomposition: $f(x) = e^y$, $y = \sin(x)$; so $f'(x) = e^y \times \cos(x)$)

5. $f(x) = \cos\left((x^3 + 3x + 1)^4\right)$

$f'(x) = -\sin\left((x^3 + 3x + 1)^4\right) \times 4(x^3 + 3x + 1)^3 \times (3x^2 + 3)$

(decomposition: $f(x) = \cos(y)$, $y = z^4$, $z = x^3 + 3x + 1$ $\Rightarrow f' = -\sin(y) \times 4z^3 \times (3x^2 + 3)$)