Math 21J **Quiz 5** **October 2, 2007** **Name:** Key

1. Find the derivative of $f(x) = \dfrac{xe^{4x}}{x^3+4}$.

$$\boxed{f' = \frac{(x^3+4)(4xe^{4x}+e^{4x}) - xe^{4x}\cdot 3x^2}{(x^3+4)^2}}$$

2. Find the derivative indicated:

(a) $\dfrac{d^3}{dx^3}\left(4x^4 - 5x^3 - 3x + 7\right)$

$$= \frac{d^2}{dx^2}\left(16x^3 - 15x^2 - 3\right)$$

$$= \frac{d}{dx}\left(48x^2 - 30x\right)$$

$$= \boxed{96x - 30}$$

(b) $\dfrac{d^2}{dt^2}\left(4e^{3t} - 5\sin 7t + 2\cos 6t\right)$

$$= \frac{d}{dt}\left(12e^{3t} - 35\cos 7t - 12\sin 6t\right)$$

$$= \boxed{36e^{3t} + 245\sin 7t - 72\cos 6t}$$

3. Find $\dfrac{dy}{dx}$ and $\left.\dfrac{dy}{dx}\right|_{(1,2)}$ where $x^3 + xy + y^3 = 11$.

$$3x^2 + xy' + y + 3y^2y' = 0$$

$$(x + 3y^2)y' = -3x^2 - y$$

$$y' = \boxed{\frac{dy}{dx} = -\frac{3x^2+y}{x+3y^2}}$$

$$\left.\frac{dy}{dx}\right|_{(1,2)} = -\frac{3+2}{1+12} = \boxed{-\frac{5}{13}}$$

4. Let $f(x) = x^3 - 4x^2 + 1$. Apply Newton's method once with $x_0 = 2$.

$$f' = 3x^2 - 8x$$

$$f(2) = 8 - 16 + 1 = -7$$

$$f'(2) = 12 - 16 = -4$$

$$x = 2 - \frac{-7}{-4} = 2 + \frac{7}{4} = \boxed{\frac{\text{[illegible]}1}{4}}$$