NON-Calculator Multiple-Choice

1. If $k(x) = 2\left(6^{3x}\right)$, then $k'(x) =$

A. 6^{3x+1}
B. $2e^{3x}$
C. $\dfrac{6^{3x}}{2}$
D. $6^{3x+1}(\ln 6)$
E. $\dfrac{6^{3x}}{\ln 6}$

2. If $f(2) = 3$, $f'(2) = 4$, and $g(x)$ is the inverse function to $f(x)$, then the equation of the tangent line to $g(x)$ at x = 3 is:

A. $y - 2 = -\dfrac{1}{4}(x - 3)$
B. $y - 2 = 4(x - 3)$
C. $y - 3 = -\dfrac{1}{4}(x - 2)$
D. $y - 2 = \dfrac{1}{4}(x - 3)$
E. $y - 3 = \dfrac{1}{4}(x - 2)$

3. If $f(x) = \ln\left(x + 4 + e^{-3x}\right)$, then $f'(0) =$

A. $-\dfrac{2}{5}$
B. $\dfrac{1}{5}$
C. $\dfrac{1}{4}$
D. $\dfrac{2}{5}$
E. nonexistent

CALCULATOR Multiple-Choice

4. Let $f(x) = 2x^5 + 2x^3 + 2x$. If *g* is the inverse function of *f*, then $g'(6) =$

A. 18
B. 1
C. $\frac{1}{13178}$
D. $\frac{1}{6}$
E. $\frac{1}{18}$

Non-Calculator Free-Response

1. The twice-differential function f is defined for all real numbers and satisfies the following conditions:

$f(0) = 2$, $f'(0) = -4$, and $f''(0) = 3$

a) The function *g* is given by $g(x) = e^{ax} + f(x)$ for all real numbers, where *a* is a constant. Find $g'(0)$ and $g''(0)$ in terms of *a*. Show the work that leads to your answers.

b) The function *h* is given by $h(x) = \cos(kx)\,f(x)$ for all real numbers, where *k* is a constant. Find $h'(x)$ and write an equation for the line tangent to the graph of *h* at *x* = 0.

2. Let *f* be the function defined by $f(x) = k\sqrt{x} - \ln x$ for *x*>0, where *k* is a positive constant.

a) Find $f'(x)$ and $f''(x)$.