11/10/2005   MA 261 Calculus I   Name:_____
Dr. Lunsford   Test 2   (100 Points Total)

I. Use the graph of the function f below to answer the following questions. The graph of f is formed using only line segments and arcs of circles. For the questions
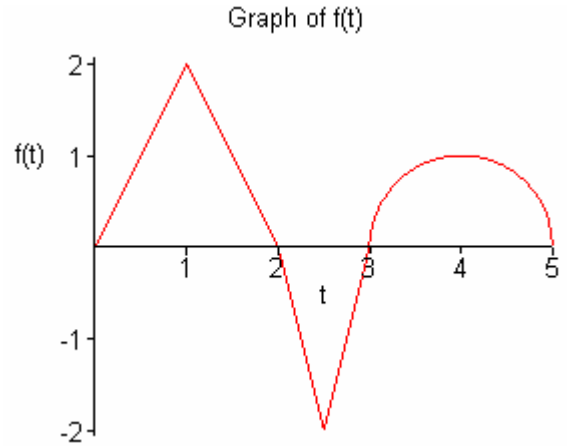
that refer to the function g , use $g(x) = \int_{2}^{x} f(t)\,dt$. (2 points

each – 14 total)

Graph of f(t)

$\int_{0}^{5} f(t)\,dt = $ _____ $\int_{3}^{0} f(t)\,dt = $ _____

$g(3) = $ _____ $g'(x) = $ _____

For the remaining questions, please write "true" or "false", according to which is correct about the statement, in the space provided next to each statement.

_____ $f'(4) < f'\left(\dfrac{3}{2}\right)$

_____ $g(0) < 0$

_____ f is differentiable at $t = 1$.

II. Suppose the acceleration of a particle moving along a straight path is given by the function $a(t) = 6t - 2$ where acceleration is in m/s^2 and t is in seconds; the velocity of the particle at time $t = 1$ seconds is zero m/s (i.e. $v(1) = 0$ where $v(t)$ is the velocity of the particle at time t); and the position of the particle at time $t = 1$ second is two meters (i.e. $p(1) = 1$ where $p(t)$ is the position function of the particle). Find the position function of the particle. Clearly indicate your answer. (5 points)

III. Below you are given part of the graph of the equation $xy^3 + \cos(y) + x^2 = x$. Find the slope of the

tangent line to the equation at the point $\left(0, \dfrac{\pi}{2}\right)$ and accurately represent this line on the graph. (5 points)
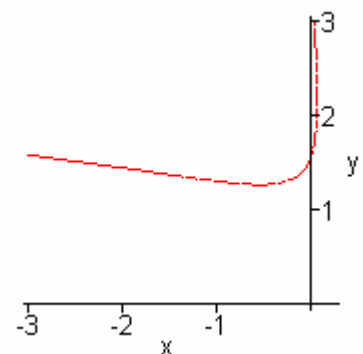
IV. Find the indicated limit, derivative, or integral. You will be awarded either full credit for a perfect answer (4 points), half credit (2 points) for a near perfect answer, or zero points otherwise. (36 points total)

1. $\lim\limits_{x\to\infty} \dfrac{\ln x}{x} =$

2. $\lim\limits_{x\to\infty} \dfrac{e^x}{x} =$

2. $\dfrac{d}{dx}(x^2+1)^{10} =$

3. $\dfrac{d}{dt}\dfrac{1}{\sqrt{7t}} =$

4. $\displaystyle\int_{-1}^{1} 3x^4 dx =$

6. $\displaystyle\int \dfrac{1}{1-x} dx =$

7. $\dfrac{d}{dx}\left(\displaystyle\int f(x)dx\right) =$

8. $\displaystyle\int \sin\left(\dfrac{\pi x}{2}\right) dx =$

9. $\displaystyle\int \dfrac{1}{e^{3x}} dx =$

V. Find the indicated limit, derivative, or integral. You must show at least one intermediate step on these problems. (5 points each – 40 points total)

1. $\lim\limits_{x\to 0^+} x^2 \ln x =$

2. $\lim\limits_{x\to 0} \dfrac{3x - \sin 3x}{4x - \sin 4x} =$

3. $y = \sin^4(3x^3 - x^2 + 1)$, $\dfrac{dy}{dx} =$

V. Find the indicated limit, derivative, or integral, continued.

4. $f(w) = \sqrt[4]{w^3} - e^{3w} \sec 4w$, $f'(w) =$

5. $\dfrac{d}{dx} \dfrac{x \tan 6x}{x^2 + x + 1} =$

6. $\displaystyle\int \dfrac{\sin 4x}{\cos^3 4x} dx =$

7. $\displaystyle\int_0^3 \dfrac{x}{\sqrt{x+1}} dx =$

8. $y = x^{\sin(3x)}$, $\dfrac{dy}{dx} =$