QUIZ #2 M427L SUMMER 2005: SPENCER STIRLING (PROF. FRIEDMAN)

Instructions: this is a multiple choice exam. Please circle the correct answer. At the end of the exam please hand in your work along with this sheet (answers marked without work shown will not be considered). Please organize your work so that it is legible!

PROBLEM 1

Consider a particle moving through space. Suppose its trajectory is described by $\overrightarrow{r}(t) = \left\{4e^{t-10}, 6t^4, \cos t\right\}$ where t denotes time. What is the velocity vector at time $t = 10$?

a) $\left\{4e^{10}, 60000, -\sin 10\right\}$
b) $\left\{4, 24000, -\sin 10\right\}$
c) $\left\{4, 60000, \cos 10\right\}$
d) NONE OF THESE

PROBLEM 2

Suppose a particle runs along a path $\overrightarrow{r}(t) = \left\{\tan t, t^2\right\}$. Given that the tangent vector at $t = \frac{\pi}{4}$ is $\left\{2, \frac{\pi}{2}\right\}$ what is the equation of the tangent line through this point?

a) $\overrightarrow{l}(t) = \left\{2t + (1 - \frac{\pi}{2}), \frac{\pi}{2}t - \frac{\pi^2}{16}\right\}$
b) $\overrightarrow{l}(t) = \left\{2t, \frac{\pi}{2}t\right\}$
c) $\overrightarrow{l}(t) = \left\{t + (2 - \frac{\pi}{4}), (\frac{\pi}{4})^2 t + (\frac{\pi}{2} - (\frac{\pi}{4})^3)\right\}$
d) NONE OF THESE

PROBLEM 3

Suppose that a particle of mass $m = 5$ kilograms has a trajectory given by $\overrightarrow{r}(t) = \{\cos t, \sin t, t\}$. What is the particle's angular momentum at time $t = \frac{\pi}{2}$? (remember $\overrightarrow{L} = \overrightarrow{r} \times m\overrightarrow{v}$) (the units here are in kg*m^2/sec).

a) $\overrightarrow{L} = \frac{\pi}{2}\widehat{i} - 5\widehat{j} + \widehat{k}$
b) $\overrightarrow{L} = 5\widehat{i} - \frac{5\pi}{2}\widehat{j} + 5\widehat{k}$
c) $\overrightarrow{L} = 5\widehat{i} + \frac{5\pi}{2}\widehat{j} + 5\widehat{k}$
d) NONE OF THESE

PROBLEM 4

What is the distance that the particle in problem #3 travels from time $t = 0$ to time $t = 27$?

a) 27π
b) 54
c) $27\sqrt{2}$
d) NONE OF THESE

Problem 5

What is the curl of $\overrightarrow{F} = \left\{\sin(xy), \cos(x^2y), 0\right\}$?
a) $\left\{-2xy\cos(xy), -x\sin(x^2y), 0\right\}$
b) $\left\{0, 0, -2xy\sin(x^2y) - x\cos(xy)\right\}$
c) $\left\{0, 0, -2xy\cos(xy) - x\sin(x^2y)\right\}$
d) NONE OF THESE

Problem 6

Let D be the region bounded by the y-axis and the parabola $x = -4y^2 + 3$. What is the value of the integral

$$\int\int_D y\,dxdy?$$

a) 1
b) $\frac{3}{2}$
c) $\frac{\sqrt{3}}{4}$
d) NONE OF THESE