Math 114. Fall 2014. HW 3. Due Sep 24th Wednesday

Instructions for written homework.

- You are encouraged to work with others on these problems. You are expected to write the solutions yourself.
- Your solutions should be legible and well organized. **Graders will deduct points for solutions that are difficult to read, or are disorganized.** For the benefit of the grader, please turn in solutions to problems in the assigned order, i.e. #1, then #2, then #3, etc.
- Staple your pages together. Do not turn in notebook paper with tattered edges. **Homework that is unstapled or is lacking a name will not be graded.**

Problem 1 (Spring 2011)**.** Calculate the arc length of the curve given parametrically by

$$x(t) = 2t^2, \quad y = \sqrt{3}t^4, \quad z = t^6$$

for $0 \leq t \leq 2$

(A) 8	(E) $81\sqrt{3}$
(B) $24\sqrt{3}$	(F) $144\sqrt{3}$
(C) 36	(G) 72
(D) $64\sqrt{3}$	(H) 108

Problem 2 (Fall 2010)**.** Let $\mathbf{r}(t) = \langle 2t, t^2, ln\, t \rangle$. Find the arclength for $1 \leq t \leq e$. Arclength =

(A) 1	(E) e
(B) $\ln 2$	(F) e^2
(C) 2	(G) 12
(D) $e - 1$	(H) 16

Problem 3 (Fall 2010). Find the maximum curvature of the curve $\mathbf{r}(t) = \langle t, t, t^2 \rangle$.

(A) 1

(B) $\frac{1}{\sqrt{2}}$

(C) $\frac{1}{\sqrt{3}}$

(D) $\frac{1}{2}$

(E) $\frac{1}{2\sqrt{2}}$

(F) $\frac{4}{7}$

(G) $\frac{1}{\sqrt{13}}$

(H) 0.

Problem 4 (Spring 2013). Assume the acceleration of gravity is $10m/sec^2$ downwards. A cannon ball is fired at ground level. If the cannon ball rises to a height of 80 meters and travels a distance 240 meters before it hits the ground, what is the magnitude of the initial velocity in meter per second?

(A) 36

(B) 48

(C) 50

(D) 54

(E) 60

(F) 64

(G) 72

(H) 80

(I) None of above.

Problem 5 (Spring 2013). Find the curvature for $\mathbf{r}(t) = \langle -t, -\ln(\cos t), 0 \rangle$ at $t = \frac{\pi}{4}$.

(A) 1

(B) $\sqrt{2}$

(C) 2

(D) $2\sqrt{2}$

(E) $\frac{\sqrt{2}}{2}$

(F) $\frac{\sqrt{3}}{2}$

(G) $3\sqrt{2}$

(H) $\frac{\sqrt{2}}{3}$

(I) none of the above

Problem 6 (Spring 2013). Let $\mathbf{r}(t) = \sqrt{2}\cos t\,\mathbf{i} + \sqrt{2}\sin t\,\mathbf{j} + t\,\mathbf{k}$. Using the parametric equations for the line tangent to the function at $t = \frac{\pi}{4}$ find the coordinates of the point where the tangent line intersects the xy-plane:

(A) (1,1,0)

(B) (1,-1,0)

(C) $(1 - \pi/4, 1 + \pi/4, 0)$

(D) $(1 + \pi/4, 1 - \pi/4, 0)$

(E) $(\pi/2 - 1, \pi/2 + 1, 0)$

(F) (1,1,$\pi/4$)

(G) (0,0,0)

(H) The line does not intersect the xy-plane

(I) None of the above.

Problem 7 (Spring 2005)**.** Find the unit tangent vector to the curve

$$\mathbf{r}(t) = e^{2t}\cos t\,\mathbf{i} + e^{2t}\sin t\,\mathbf{j} + e^{2t}\,\mathbf{k}$$

at the point where $t = \pi/2$.

(A) $\langle 2/3 - 2/3, 1/3\rangle$

(B) $\langle 2/3, -1/3, 2/3\rangle$

(C) $\langle -1/3, 2/3, 2/3\rangle$

(D) $\langle -1/3, -2/3, -2/3\rangle$

(E) $\langle 3/\sqrt{14}, 2/\sqrt{14}, -1/\sqrt{14}\rangle$

(F) $\langle -3/\sqrt{14}, -2/\sqrt{14}, -1/\sqrt{14}\rangle$

(G) None of above

Problem 8 (Fall 2009)**.** A news helicopter is descending along the helix $\langle \sin(\pi t), \cos(\pi t), 10-t\rangle$. At time $t = 5$ the crew turns on a powerful head light shining straight ahead in the direction of the velocity. What spot on the ground, i.e. what point on the xy-plane, does this beam of light hit?

(A) $(-\pi, 0)$

(B) (0,-1)

(C) $(0, 0)$

(D) $(-5\pi, -1)$

(E) $(\pi, 5)$

(F) None of the above.