MATH 2850 Sec 007

ELEMENTARY MULTIVARIABLE CALCULUS

QUIZ 1

September 6, 2012

Name (Last, First) Key.

1. Find the point on the curve

$$r(t) = (12\sin t)\mathbf{i} - (12\cos t)\mathbf{j} + 5t\mathbf{k}$$

at a distance of 13π units along the curve from the point $(0, -12, 0)$ in the direction of increasing arc length.

$r(0) = 0i - 12j + 0k$. $\therefore$ $(0,-12,0)$ corresponds to $t=0$.

Arc Length function $s(t) = \int_0^t |v(\tau)|\, d\tau$

$= \int_0^t \sqrt{(12\cos t)^2 + (12\sin t)^2 + 5^2}\, d\tau = \int_0^t \sqrt{169}\, d\tau = 13t$

Hence $13t = 13\pi$

$\Rightarrow t = \pi$

$r(\pi) = 0i + 12j + 5\pi k$.

Hence the other point is $(0, 12, 5\pi)$

2. Find the limits by rewriting the fractions first.

$$\lim_{\substack{(x,y)\to(-1,0)\\ x+1\neq y}} \frac{x+1-y}{\sqrt{x+1}-\sqrt{y}}$$

$\lim_{(x,y)\to(-1,0)} \frac{(x+1-y)(\sqrt{x+1}+\sqrt{y})}{(\sqrt{x+1}-\sqrt{y})(\sqrt{x+1}+\sqrt{y})}$

$= \lim_{(x,y)\to(-1,0)} \frac{(x+\cancel{1}-y)(\sqrt{x+1}+\sqrt{y})}{(x+\cancel{1}-y)}$

$= \lim_{(x,y)\to(-1,0)} \sqrt{x+1}+\sqrt{y} = \sqrt{-1+1}+\sqrt{0} = 0$