CALCULUS BC NAME_____
REVIEW CIRCUIT – PARAMETRICS AND VECTORS

Work problem 1. Find the problem with the answer to problem 1. Number this problem #2. Continue numbering the problems in this fashion.

Answer: 0.331

# 1 – Given $x = 2t^3 + 5,\ y = 6t^5 - 12t^4 + 7,$ find $\frac{dy}{dx}$.

Answer: $y - 5 = 0.902(x + 1)$

#____ - A particle moves along a curve so that the velocity vector is given by $v(t) = \langle 3\sin(e^t),\ 5^{\ln t} \rangle,\ t > 0.$ Find the acceleration vector at $t = 2$.

Answer: 4

#____ - A particle moves in the so that $\frac{dx}{dt} = e^{t/3}$ and $\frac{dy}{dt} = \cos(5t)$. What is the speed of the particle when $t = 2$?

Answer: 6.370

#____ - An object moving along a curve in the $xy$-plane has $\frac{dy}{dt} = 3 + e^{\sin t}$. The derivative $\frac{dx}{dt}$ is not explicitly given. At time $t = 2$, the value of $\frac{dy}{dx}$ is $-5.4$. Find the value of $\frac{dx}{dt}$ when $t = 2$.

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Answer: 0.647

#____ - A particle moves along a curve so that $\frac{dx}{dt} = e^{\cos t}$ and $\frac{dy}{dt} = t^2 + 3\sin t$. At $t = 1$, the particle is at the point $(4, -7)$. Find the position of the particle at the point when $t = 2$.

Answer: $\langle 3.979, -15.832 \rangle$

#____ - A particle moves in the $xy$-plane so that $\frac{dx}{dt} = 3t - \cos\left(t^2\right)$ and $\frac{dy}{dt} = 4t + \sin t$. For $0 \le t \le 1$, what is the value of $t$ at which the line tangent to the path of the particle is vertical?

Answer: 2.121

#____ - A particle moves in the $xy$-plane so that $\frac{dx}{dt} = \sin\left(t^2\right)$ and $\frac{dy}{dt} = e^{\cos t}$. At $t = 3$, the particle is at the position $(-1, 5)$. Write the equation of the tangent line to the curve at the point where $t = 3$.

Answer: $-1.015$

#____ - A particle moves along a curve in the $xy$-plane so the its position is given by $x(t) = 3t + \sin\left(t^2\right)$ and $y(t) = 5 + \cos\left(e^{2t}\right)$, $0 \le t \le \pi$. Find the velocity vector when the particle's horizontal position is $x = 4$.

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Answer: $5t^2 - 8t$

#____ - Use your answer to the previous problem to find $\dfrac{d^2y}{dx^2}$.

Answer: $(5.113,\ -1.797)$

#____ - A particle moves along a curve so that $\dfrac{dx}{dt} = \sin\left(e^{t/4}\right)$ and $\dfrac{dy}{dt} = \sqrt{t^2+5}$. Find the total distance traveled by the particle over the time interval $1 \le t \le 3$.

Answer: $\langle 9.939,\ 2.455 \rangle$

#____ - A particle moves along a curve so that $\dfrac{dx}{dt} = \cos\left(t^2\right)$ and $\dfrac{dy}{dt} = e^{\sin t}$. For what value of $t$, $0 < t < 1$, does the tangent line to the curve have a slope of 2?

Answer: $\dfrac{10t-8}{6t^2}$

#____ - The position of a particle moving in the $xy$-plane is given by the parametric equations $x(t) = t^3 - 6t^2$ and $y(t) = 2t^3 - 9t^2 - 24t$. For what value of $t$ is the particle at rest?

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