

#1 Calculus – Hustle
National MA© 2008

A particle's position on the x-axis is defined by $x(t) = t^3 - 6t^2 + 9t + 7$. Find the interval(s) that the speed of the particle increasing.

Answer : _____

Round 1 2 3 4 5

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**#2 Calculus – Hustle
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$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \left(\frac{3-5i}{n^2} \right)$$

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Answer : _____

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#3 Calculus – Hustle
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$$\int \frac{x^3}{x^2-1} dx$$

Answer : _____

Round 1 2 3 4 5

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**#4 Calculus – Hustle
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Given $f(x) = 2^{x^3}$

Find $f'(x)$

Answer : _____

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#5 Calculus – Hustle
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Given

$$x(t) = e^{\pi t} \text{ and } y(t) = \cos(\pi t)$$

Find $\frac{d^2y}{dx^2}$ at $t = \frac{1}{2}$

Answer : _____

Round 1 2 3 4 5

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**#6 Calculus – Hustle
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Given $F(x) = \int_{-x^2}^1 e^{t^3} dt$

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#7 Calculus – Hustle
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What is the linear approximation of $\sqrt{50}$ given $\sqrt{49} = 7$?

Answer : _____

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**#8 Calculus – Hustle
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Evaluate:

$$\int_0^{\ln\sqrt{3}} \frac{e^x}{\sqrt{4-e^{2x}}} dx$$

Answer : _____

Round 1 2 3 4 5

**#8 Calculus – Hustle
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#9 Calculus – Hustle
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Find the volume of the solid formed when the graph $9x^2 + 4y^2 - 36x + 56y + 196 = 0$ is revolved about the x-axis.

Answer : _____

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Answer : _____

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**#10 Calculus – Hustle
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Evaluate:

$$\lim_{x \rightarrow 0} \left(1 + \frac{1}{3x}\right)^{3x}$$

Answer : _____

Round 1 2 3 4 5

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#11 Calculus – Hustle
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Find the slope of the line normal to the curve $x^2y + 3xy^2 = 2$ in quadrant IV when $x = 1$.

Answer : _____

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#12 Calculus – Hustle
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Find the rate of change of the volume of a cube in cm^3/sec that has surface area changing at a rate of $4 cm^2/sec$ when the volume of the cube is $8 cm^3$.

Answer : _____

Round 1 2 3 4 5

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#13 Calculus – Hustle
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Given $f(x) = \sqrt{x + 3\sqrt{x + 3\sqrt{x + 3\dots}}}$

Find $f'(4)$

Answer : _____

Round 1 2 3 4 5

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#14 Calculus – Hustle
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Find the interval of convergence of

$$\sum_{n=0}^{\infty} \frac{(x-2)^{n+1}}{(n+1)4^{n+1}}$$

Answer : _____

Round 1 2 3 4 5

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#15 Calculus – Hustle
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If $f(x) = \left(\frac{2}{x} + x^2\right)^9$, find the coefficient of the x^5 term of $f'(x)$.

Answer : _____

Round 1 2 3 4 5

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#16 Calculus – Hustle
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Find the particular solution, $y = f(x)$, to
the differential equation $\frac{dy}{dx} = \frac{y(x+2)}{x}$
given $y(1) = 2e$.

Answer : _____

Round 1 2 3 4 5

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#17 Calculus – Hustle
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If $f(x) = \tan x, -\frac{\pi}{2} < x < \frac{\pi}{2}$ and
 $f^{-1}(x) = g(x)$, find $g'(\sqrt{3})$.

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#18 Calculus – Hustle
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Find the absolute maximum value of the function $f(x) = 3x^5 - 5x^3 - 1$ on the interval $[-2, 2]$

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#19 Calculus – Hustle
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Find the area of ONE petal of the polar graph $r = 2 \cos(3\theta)$

Answer : _____

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#20 Calculus – Hustle
National MA© 2008

Find the volume of the solid formed by revolving the region bounded by $y = x^2$, $y = x + 3$ and $x = 0$, revolved about the x-axis.

Answer : _____

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#20 Calculus – Hustle
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#21 Calculus – Hustle
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The equation of an ellipse is given by

$$\frac{(x-2)^2}{a^2} + \frac{(y+4)^2}{b^2} = 1. \text{ Find the rate of change}$$

in the area of the ellipse in $\frac{\text{units}}{\text{sec}^2}$ if the minor axis is decreasing at a rate of $0.4 \frac{\text{units}}{\text{sec}}$ and the major axis is increasing at a rate of $0.6 \frac{\text{units}}{\text{sec}}$ and the major axis has length 10 units and minor axis has length 6 units.

Answer : _____

Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#22 Calculus – Hustle
National MA© 2008

If $y = \ln \sqrt[3]{x^6 \sin(3x)}$, find $\frac{dy}{dx}$.

Answer : _____

Round 1 2 3 4 5

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#23 Calculus – Hustle
National MA© 2008

Find the sum of the values for x that satisfy the Mean Value Theorem for Integrals for the function $f(x) = (x-1)^2$ over the interval $[4, 7]$

Answer : _____

Round 1 2 3 4 5

#23 Calculus – Hustle
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#24 Calculus – Hustle
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Find the coefficient of the x^6 term of the Taylor expansion of $f(x) = \cos x$ centered about $x = \frac{\pi}{6}$.

Answer : _____

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Round 1 2 3 4 5

#25 Calculus – Hustle
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If $f\left(\frac{3}{x}\right) = x^2 - 3x$, find $\frac{d[f(x)]}{d(2\ln x)}$.

Answer : _____

Round 1 2 3 4 5

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