

Directions: Beginning in cell #1, do and show the work necessary to answer the question. Search for your answer and call that cell #2. Continue in this manner until you complete the circuit. Do not use a graphing calculator (or any calculator) for problems 1-23. However, problems 24-36 will require a graphing calculator! You will find a calculator icon if one is needed.

Answer: 9

1 $\frac{d}{dx}(\cos(x^2))$

Answer: 5

_____ Find the average rate of change for the function $f(x) = 2 \cos(x^2)$ on the interval $[1, 3]$.



Answer: 5.067

_____ Given $f(2) = 3.58$ and $f'(2) = -1.23$. Use the tangent line to $f(x)$ at $x = 2$ to estimate $f(2.05)$.

Answer: $-\sqrt{5}$

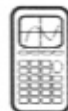
_____ $y = x^2 \sec x$. Find $y'(\frac{\pi}{4})$.

Answer: -4

_____ Find $\frac{dy}{dx}$ for the circle $(x - 3)^2 + (y - 2)^2 = 25$.

Answer: -1.451

_____ Find the x-coordinate for the local minimum of $g(x)$ on the interval $(0, 10)$ if $g'(x) = 0.6x^2 \sin x$.



Answer: 18.981

_____ A spherical hot air balloon inflates at a rate of 101 ft³/min. At what rate is the radius changing when the surface area is 20.2 ft²? [Note: $V = \frac{4}{3}\pi r^3$, $SA = 4\pi r^2$]

Answer: $-2x \sin(x^2)$ # _____ $\int e^{3x} dx$ Answer: $-\frac{25}{64}$

_____ Selected values for $h(t)$ are shown in the table. Let $f(x) = \int_0^{\sqrt{x}} h(t) dt$. Find $f'(4)$.

t	1	2	4
$h(t)$	$\frac{1}{2}$	3	1
$h'(t)$	7	$\frac{2}{3}$	-5


Answer: $y = -\sqrt{2 \sin x + 3}$

_____ Find the particular solution, $y = f(x)$, to the differential equation $\frac{dy}{dx} = \frac{\cos x}{y}$ given $f(\frac{3\pi}{2}) = -1$ and then find $f(\frac{\pi}{2})$.

Answer: $\frac{1}{3}e^{3x} + C$ # _____ $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sec^2 \theta d\theta$

Answer: 3.8

_____ Find the area enclosed by the graphs of $f(x) = 2 - x$ and $g(x) = x^2$.

<p>Answer: $\frac{1-6xy}{3x^2-2}$</p> <p># _____ The position function of a particle moving horizontally along the x-axis is given by $x(t) = \sin(3t - 2\pi) + t$. Find the initial velocity of the particle.</p>	<p>Answer: $\frac{3-x}{y-2}$</p> <p># _____ The function $g(x)$ is continuous on the closed interval $[e, \pi]$ and differentiable on the open interval (e, π). If $x = 3$ is where the slope of the tangent line is the same as the slope of the secant line from $x = e$ to $x = \pi$, and if $g'(3) = 2, g(e) = -2\pi$, find $g(\pi)$.</p>
<p>Answer: 8.278</p> <p># _____ The rate at which oil leaks out of a ruptured tanker is modeled by the equation $R(t) = \frac{x^2}{\sqrt{x+1}}$ for time $0 \leq t \leq 5$, where $R(t)$ is measured in hundreds of barrels per hour. Find the amount of oil (in hundreds of barrels) that leaked out of the tanker in the first three hours.</p> 	<p>Answer: 2</p> <p># _____ Write the equation of the line tangent to $y = x^3 - 2x + 3$ at $x = -1$.</p>
<p>Answer: $-\frac{51}{25}$</p> <p># _____ $\lim_{x \rightarrow -\infty} \frac{\sqrt{25x^2+x}}{64x-3}$</p>	<p>Answer: 4.5</p> <p># _____ The function $g(x)$ is odd and continuous for all x. If $\int_0^a g(x)dx = 3.5$, what is $\int_{-a}^a g(x)dx$?</p>

Answer: 17.653

_____ Find the area enclosed by the graph of $y = \frac{10}{1+x^2}$ and the line $y = 1$.



Answer: 4

_____ Evaluate $\frac{d^2y}{dx^2}$ for the conic section $x^2 - y^2 = 25$ at the point $(-\sqrt{41}, 4)$.

Answer: $y = x + 5$

_____ Find $\frac{dy}{dx}$ for the relation $3yx^2 - 2y = x$.

Answer: $-2e$

_____ The area enclosed by the graphs of $y = 1/x$, $y = 1$, and $x = 3$ is rotated about the line $y = -1$. Find the volume.



SKIP

Ans = 9.852

Answer: $-x \sin(x^2)$

_____ Find the particular solution, $y = f(x)$, to the differential equation $\frac{dy}{dx} = \frac{\cos x}{y}$ given $f(\frac{3\pi}{2}) = -1$.

Answer: $\frac{3}{4}$

_____ On what interval(s) is the function $g(x) = -x^4 - 2x^2$ increasing and concave down? To advance in the circuit, select the x-value from the choices below that is on the answer interval(s).

- | | | |
|----|---|---|
| -8 | 0 | 9 |
|----|---|---|

Answer: $-\frac{5}{64}$

_____ Find the linear approximation to $f(x) = 4 + \ln(2x)$ at $x = \frac{1}{2}$ and use it to approximate $f(0.4)$.

Answer: 3.519

_____ In question 4, the cubic function and the tangent line at $x = -1$ intersect twice, once at the point of tangency and one other time. Find the sum of the coordinates of the other intersect point.



Answer: 0

_____ Find the volume of the solid generated when the region enclosed by $y = -\sqrt{x+1}$, $y = 0$, and $x = 2$ is revolved about the x-axis.

SKIP

Ans = 4.5π

Answer: 2π

_____ What is the minimum distance from $y = (x - 2)^3$ to the point $(1, 0)$?



Answer: 1.775

_____ Find the average value of the function $h(x) = (2.468)^x$ on the interval $[1, 4.5]$.



Answer: -8

_____ Find $f'(-3)$ for the function $f(x) = \frac{3x-2}{x^2-4}$.

Answer: 0.352

_____ Find the area of the region enclosed by the graphs of $y = \sqrt{9 - x^2}$ and $y = -0.1x + 1$.



Answer: 9.852

_____ Given that $f'(x) = 6 \ln x$ and $f(2) = -3.682$, find $f(3)$.



Answer: $\frac{9\pi}{2}$

_____ $\lim_{x \rightarrow 0} \frac{(2+x)^3 - 8}{x}$

Answer: 0.445

_____ For what value of x do $y = x^2$ and $y = -e^{-x}$ have parallel tangents?



Answer: $\frac{\pi^2 + 8\pi}{8\sqrt{2}}$

_____ Find a and b so that the function $f(x) = \begin{cases} e^{-ax}, & x \leq 0 \\ x^2 + 5x + b, & x > 0 \end{cases}$ is differentiable everywhere.

To advance in the circuit, find the sum of a and b .

Answer: 12

_____ $\frac{d}{dx} \int_{x^2}^3 \left(\frac{1}{2} \sin t\right) dt$