Review for Differential Equations

The graph of $y = 5x^4 - x^5$ has a point of inflection at

(A) $(0,0)$ only (B) $(3,162)$ only (C) $(4,256)$ only

(D) $(0,0)$ and $(3,162)$ (E) $(0,0)$ and $(4,256)$

The area of the region bounded by the lines $x = 0$, $x = 2$, and $y = 0$ and the curve $y = e^{\frac{x}{2}}$ is

(A) $\frac{e-1}{2}$ (B) $e-1$ (C) $2(e-1)$ (D) $2e-1$ (E) $2e$

The region enclosed by the graph of $y = x^2$, the line $x = 2$, and the x-axis is revolved about the y-axis. The volume of the solid generated is

(A) 8π (B) $\frac{32}{5}\pi$ (C) $\frac{16}{3}\pi$ (D) 4π (E) $\frac{8}{3}\pi$

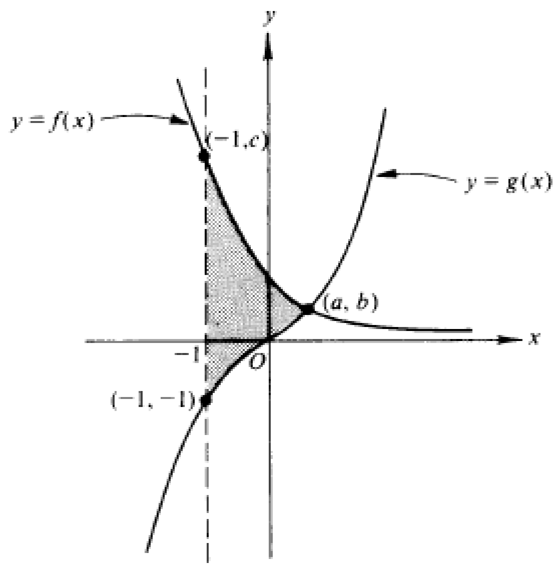
Solve the differential equation $e^{x+y}\,dy = dx$.

a) $e^{-x} + e^{y} = C$ b) $e^{-x} + e^{-y} = C$ c) $e^{x} + e^{y} = C$

d) $e^{x} + e^{-y} = C$ e) $e^{-x} + 2e^{-y} = C$

The base of a solid is a circular region in the xy-plane bounded by the graph of $x^2 + y^2 = 36$. Find the volume of the solid if every cross section by a plane normal to the x-axis is an equilateral triangle with one side on the base.

a) $72\sqrt{3}$ b) $288\sqrt{3}\pi$ c) $144\sqrt{3}\pi$ d) $144\sqrt{3}$ e) $288\sqrt{3}$



The curves $y = f(x)$ and $y = g(x)$ shown in the figure above intersect at the point (a, b). The area of the shaded region enclosed by these curves and the line $x = -1$ is given by

(A) $\int_0^a (f(x) - g(x))\,dx + \int_{-1}^0 (f(x) + g(x))\,dx$

(B) $\int_{-1}^b g(x)\,dx + \int_b^c f(x)\,dx$

(C) $\int_{-1}^c (f(x) - g(x))\,dx$

(D) $\int_{-1}^a (f(x) - g(x))\,dx$

(E) $\int_{-1}^a (|f(x)| - |g(x)|)\,dx$

Which of the following gives the area of the surface generated by revolving about the y-axis the arc of $x = y^3$ from $y = 0$ to $y = 1$?

(A) $2\pi\int_0^1 y^3\sqrt{1+9y^4}\,dy$

(B) $2\pi\int_0^1 y^3\sqrt{1+y^6}\,dy$

(C) $2\pi\int_0^1 y^3\sqrt{1+3y^2}\,dy$

(D) $2\pi\int_0^1 y\sqrt{1+9y^4}\,dy$

(E) $2\pi\int_0^1 y\sqrt{1+y^6}\,dy$

The region in the first quadrant between the x-axis and the graph of $y=6x-x^2$ is rotated around the y-axis. The volume of the resulting solid of revolution is given by

(A) $\int_0^6 \pi\left(6x-x^2\right)^2 dx$

(B) $\int_0^6 2\pi x\left(6x-x^2\right) dx$

(C) $\int_0^6 \pi x\left(6x-x^2\right)^2 dx$

(D) $\int_0^6 \pi\left(3+\sqrt{9-y}\right)^2 dy$

(E) $\int_0^9 \pi\left(3+\sqrt{9-y}\right)^2 dy$

The base of a solid is the region enclosed by the graph of $y=e^{-x}$, the coordinate axes, and the line $x=3$. If all plane cross sections perpendicular to the x-axis are squares, then its volume is

(A) $\dfrac{\left(1-e^{-6}\right)}{2}$ (B) $\dfrac{1}{2}e^{-6}$ (C) e^{-6} (D) e^{-3} (E) $1-e^{-3}$

A region in the first quadrant is enclosed by the graphs of $y=e^{2x}$, $x=1$, and the coordinate axes. If the region is rotated about the <u>y-axis</u>, the volume of the solid that is generated is represented by which of the following integrals?

(A) $2\pi\int_0^1 xe^{2x}\,dx$

(B) $2\pi\int_0^1 e^{2x}\,dx$

(C) $\pi\int_0^1 e^{4x}\,dx$

(D) $\pi\int_0^e y\ln y\,dy$

(E) $\dfrac{\pi}{4}\int_0^e \ln^2 y\,dy$

An equation of the line tangent to the graph of $y=\dfrac{2x+3}{3x-2}$ at the point $(1,5)$ is

(A) $13x-y=8$ (B) $13x+y=18$ (C) $x-13y=64$

(D) $x+13y=66$ (E) $-2x+3y=13$

If the region enclosed by the y-axis, the line $y = 2$, and the curve $y = \sqrt{x}$ is revolved about the y-axis, the volume of the solid generated is

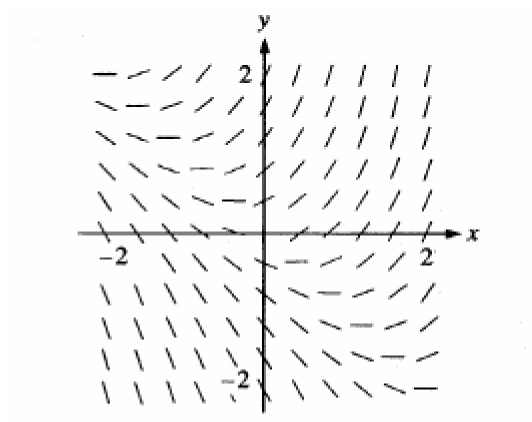
(A) $\frac{32\pi}{5}$ (B) $\frac{16\pi}{3}$ (C) $\frac{16\pi}{5}$ (D) $\frac{8\pi}{3}$ (E) π

An equation of the line tangent to the graph of $y = x + \cos x$ at the point $(0,1)$ is

(A) $y = 2x+1$ (B) $y = x+1$ (C) $y = x$ (D) $y = x-1$ (E) $y = 0$

What is the area of the region between the graphs of $y = x^2$ and $y = -x$ from $x = 0$ to $x = 2$?

(A) $\frac{2}{3}$ (B) $\frac{8}{3}$ (C) 4 (D) $\frac{14}{3}$ (E) $\frac{16}{3}$



Shown above is a slope field for which of the following differential equations?

(A) $\frac{dy}{dx} = 1 + x$ (B) $\frac{dy}{dx} = x^2$ (C) $\frac{dy}{dx} = x + y$ (D) $\frac{dy}{dx} = \frac{x}{y}$ (E) $\frac{dy}{dx} = \ln y$

. The area enclosed by the curves $y = x^2 - 4$ and $y = 2x - 4$ can be represented by the integral

(A) $\int_{-4}^{0} (x^2 - 2x)\, dx$

(B) $\int_{0}^{2} (2x - x^2)\, dx$

(C) $\int_{-4}^{0} (2x - x^2)\, dx$

(D) $\int_{0}^{2} (x^2 - 2x)\, dx$

(E) $\int_{-4}^{2} (x^2 - 2x)\, dx$