6.4

8. $\frac{d}{dx}\int_0^{x^2} e^{-t^2}\,dt =$

(a) $2xe^{-x^2}$
(b) e^{-x^4}
(c) $2xe^{-x^4}$
(d) $2xe^{x^4}$
(e) $22xe^{-x^2}$

$e^{-(x^2)^2} \cdot 2x$ d(stuff)

$\boxed{2xe^{-x^4}}$

$$\frac{d}{dt}\int_x^{x^2} e^{-t^2}\,dt$$

$$= \frac{d}{dt}\left(\int_x^0 e^{-t^2}\,dt + \int_0^{x^2} e^{-t^2}\,dt\right)$$

$$= \frac{d}{dt}\left(-\int_0^x e^{-t^2}\,dt + \int_0^{x^2} e^{-t^2}\,dt\right)$$

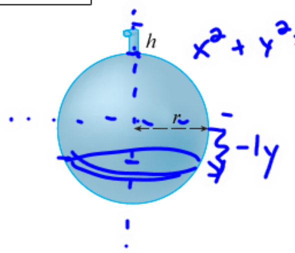
$$= -e^{-x^2} + e^{-(x^2)^2}\cdot 2x$$

$$= \boxed{2xe^{-x^4} - e^{-x^2}}$$

7.4 Question Details — SCalc7 5.4.026.Custom.TAMU [2023559]

A tank is half full of a liquid that has a density of 900 kg/m^3. Find the work W required to pump the liquid out of the spout. (Use 9.8 m/s^2 for g. Assume r = 9 m and h = 3 m.)

W = [ ] J



$x^2 + y^2 = 81$

$$W = \int_{-9}^{0} \rho g \pi (81 - y^2)(12 - y)\,dy$$

$$\text{dist} = -1y + 9 + 3$$
$$= 12 - y$$

OR

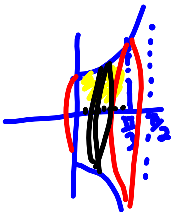
(if down as positive)

$$\int_{0}^{9} \rho g \pi (81 - y^2)(y + 12)\,dy$$

Solution or Explanation

Click to View Solution

7.2 rotating $y = \sec x$, $y=0$, $x=0$, $x = \frac{\pi}{3}$ about x-axis



Same = slices

$V = \pi r^2 h$

$r = y - 0 = \sec x$

$h = dx$

$$V = \int_0^{\pi/3} \pi \sec^2 x \, dx$$

$$= \pi \tan x \Big|_0^{\pi/3}$$

$$= \pi\left(\tan \frac{\pi}{3} - \tan 0\right)$$

$$= \boxed{\pi\left(\sqrt{3}\right)}$$

6.5

3. If f is continuous and $\int_0^4 f(x)dx = 10$, find $\int_0^2 f(2x)dx$

Subst

Let $u = 2x$

then $du = 2\,dx$

$dx = \frac{du}{2}$

if $x = 0$, $u = 0$

$x = 2$, $u = 4$

(a) 5

(b) 10

(c) 2

(d) 1

(e) 20

$$\int_0^2 f(2x)dx = \int_0^4 f(u)\frac{du}{2}$$

$$= \frac{1}{2}\int_0^4 f(u)\,du$$

$$= \frac{1}{2}(10)$$

$$= 5$$

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7.2

6. The base of a solid is the parabolic region between the graphs of $y = 1$ and $y = x^2$. Cross-sections perpendicular to the y-axis are squares. Find the volume of the solid.

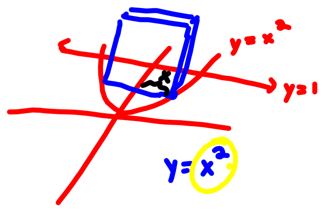
(a) 2

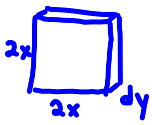
(b) 4/3

(c) 3

(d) 1

(e) 1/3





$V_{slice} = 4x^2\,dy$

$= 4y\,dy$

$V_{tot} = \int_0^1 4y\,dy$

$= 2y^2\Big|_0^1$

7.4

A heavy rope, 30 ft long, weighs 0.8 lb/ft and hangs over the edge of a building ~~x~~ ft high.

(a) How much work W is done in pulling the rope to the top of the building?

W = ft-lb

(b) How much work W is done in pulling half the rope to the top of the building?

W = ft-lb

(30)(.8)

$F(y) = 24 - 0.8y$

$W = \int F(y)\,dy$

(a) $= \int_0^{30} (24 - 0.8y)\,dy$

(b) $= \int_0^{15} (24 - 0.8y)\,dy$

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