$\frac{\sin}{\cos}$ $\frac{\pi/2}{0}$

Gavin Milas

$800 \cdot 9.8 \cdot 10 = 78{,}400$

1. $F = \boxed{\int_0^{10} (9.8 \cdot 15)(10-y)\,dy + 78{,}400}$

2. $y = \frac{x^2}{16}$ $\quad 16y = x^2$ $\quad \pm 4\sqrt{y} = x$

$w = 2 \cdot (4\sqrt{y})$ ~~wrong~~

$= 8(\sqrt{y})$

$\boxed{F = \int_0^{25} 1000 \cdot 9.8(8\sqrt{y})(y-25)\,dy}$

3. $\int_0^1 \frac{x^2}{1+x^6} = \int_0^1 \frac{x^2}{1+(x^3)^2}\,dx$ $\quad u = x^3$

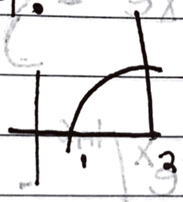
$du = 3x^2\,dx$

$\frac{1}{3}du = x^2\,dx$

$\frac{1}{3}\int_0^1 \frac{1}{1+u^2}\,du$ $\quad \frac{1}{3}\arctan u \Big|_0^1 \left(\frac{1}{3} \cdot \frac{\pi}{4}\right) - \left(0 \cdot \frac{1}{3}\right)$

$\boxed{= \frac{\pi}{12}}$

4. $y = \ln x$ $\quad y = 0$ $\quad x = 2$



$2\pi \int_1^2 (x \ln x)\,dx$

ILATE

$u = \ln x$ $\quad du = \frac{1}{x}\,dx$

$dv = x\,dx$ $\quad v = \frac{1}{2}x^2$

$2\pi\left(\frac{1}{2}x^2 \ln x \Big|_1^2 - \int \frac{1}{x} \cdot \frac{x^2}{2}\right) = 2\pi\left(\frac{1}{2}x^2 \ln x \Big|_1^2 - \int_1^2 \frac{x}{2}\,dx\right)$

$\frac{x^2}{2} \cdot \frac{1}{2}$

$2\pi\left(\left(\frac{1}{2}x^2 \ln x\right)\Big|_1^2 - \frac{x^2}{4}\Big|_1^2\right)$

$2\pi\left((2\ln 2 - 0) - \left(1 - \frac{1}{4}\right)\right) = \boxed{2\pi\left(2\ln 2 - \frac{3}{4}\right)}$

Gorin McKay

1\. A $4-2y=y-2$ $\boxed{(0,2)}$

$6=3y$ $=$ $y=2$

B.

$y-2=4+2y-y^2$

$y^2+y-2=4+2y$ $y^2=6+y$ $y=3$

$(y^2-y-6)=0$ $\cancel{y=-2}$

$\boxed{B.\ (3,1)}$ $(y-3)(y+2$

C.

$4-2y=4+2y-y^2$ -2 ∓ 2

$y^2+4-2y=4+2y$

$y(y-4)=0$

$y^2-4y=0$

$y=4,0$ $\boxed{C.\ (0,4)}$

B.

$$=\int_0^4 (4+2y-y^2-4-2y)\,dy+\int_0^1 (y-2-4-2y)\,dy$$

$x^3=4x$ $\quad x^2=4$ $\quad x=(2,-2)$

Gavin McKay

2. $= \int_0^2 (x^3-4x)^2\,dx$

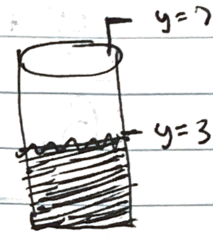
3. $40 = k\cdot .5$

$k=80$

$\int_0^3 80x\,dx = 40x^2\Big|_0^3$ $\boxed{360\text{ N}}$

4. $A(x) = 4\pi$

$\int_0^3 4\pi\cdot 1000\cdot g\,(7-y)\,dy$



5. $\int x^2 e^{-5x}\,dx$ $\quad$ ILATE

$u=x^2$ $\quad du=2x\,dx$

$dv=e^{-5x}\,dx$ $\quad d= -\frac{1}{5}e^{-5x}$

$= -\frac{1}{5}e^{-5x}x^2 - \int 2x \cdot -\frac{1}{5}e^{-5x}\,dx$

$= -\frac{1}{5}e^{-5x}x^2 + \int \frac{1}{5}e^{-5x}\,2x\,dx$

$u=2x$ $\quad du=2$

$dv=\frac{1}{5}e^{-5x}$ $\quad d= -\frac{1}{25}e^{-5x}$

$= -\frac{1}{5}e^{-5x}x^2 - \frac{1}{25}e^{-5x}\,2x + \int +\frac{2}{25}e^{-5x}\,dx$

$= \boxed{-\frac{1}{5}e^{-5x}x^2 - \frac{1}{25}e^{-5x}\,2x - \frac{2}{125}e^{-5x}}$

$\frac{1}{2}(2x+8)^{-1/2} \cdot 2$

$(2x+8)^{1/2}$

Gavin McRay

6. $f(x) = \sqrt{2x+8}$

A) $f'(x) = \frac{1}{2}(2x+8)^{-1/2} \cdot 2$

$f'(x) = \frac{1}{\sqrt{2x+8}}$ $\quad f'(x)^2 = \frac{1}{\sqrt{2x+8}} \cdot \frac{1}{\sqrt{2x+8}}$

$f'(x)^2 = \frac{1}{2x+8}$ $\quad 2\pi \int_0^8 \sqrt{2x+8} \cdot \sqrt{1+\left(\frac{1}{2x+8}\right)}\, dx$

$2\pi \int_0^8 \sqrt{2x+8\left(1+\frac{1}{2x+8}\right)}\, dx$

$= 2\pi \int_0^8 \sqrt{2x+8+\frac{\cancel{2x+8}}{\cancel{2x+8}}}\, dx = 2\pi \int_0^8 \sqrt{2x+9}\, dx$

$u = 2x+9 \quad du = 2dx$

$\frac{1}{2}du = dx \quad = 2\pi \cdot \frac{1}{2} \int_9^{25} \sqrt{u}\, dx$

$= \pi \int_9^{25} \sqrt{u}\, dx = \pi\left(\frac{2\sqrt{u^3}}{3}\right)\Big|_9^{25} \pi\left(\frac{1250}{3} - \frac{162}{3}\right)$

$\boxed{= \pi\left(\frac{1082}{3}\right)}$

1200
82
1182
1082

b. $f(y) = \ln(3y+2)$ $\quad f'(y) = \frac{3}{3y+2}$

$f'(y) = \frac{1}{3y+2} \cdot 3$

$$\boxed{\int_1^4 \sqrt{1+\left(\frac{3}{3y+2}\right)^2}\, dy}$$

Gavin McKay

7\. A. $\pi \int_0^2 (y^4)^2 \, dy$

B. $\pi \int_0^{16} (3 - \sqrt[4]{x})^2 - (3-2)^2 \, dx$

C. $2\pi \int_0^2 (y-2)(y^4) \, dy$

D. $2\pi \int_0^{16} (x+1)(\sqrt[4]{x} + 1) \, dx$

- I think there is a typo on the exam for this question "around $x = 1$?"