Math 1B (7:30am – 8:20am)
Quiz 6 Version O
Fri May 20, 2011

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your DeAnza ID number ? ___ ___

SCORE: ___ / 30 POINTS

NO CALCULATORS ALLOWED

SHOW PROPER ALGEBRAIC WORK
USE PROPER NOTATION & SIMPLIFY ALL ANSWERS WHERE REASONABLE

MULTIPLE CHOICE: CIRCLE THE CORRECT ANSWER **SCORE: ___ / 3 POINTS**

The average value of $f(x) = \dfrac{4-3x}{\sqrt{x}}$ on $[1, 4]$ is

[a] ➡ $-\frac{4}{3}$ [b] ➡ -2 [c] ➡ $\frac{3}{2}$ [d] ➡ $-\frac{11}{6}$ [e] ➡ $-\frac{5}{3}$ [f] ➡ 6

Find the value of c guaranteed by the Integral Mean Value Theorem for $f(x) = 3x^2 + 10$ on $[-4, 1]$. **SCORE: ___ / 4 POINTS**

$$3c^2+10 = \frac{1}{1-(-4)}\int_{-4}^{1}(3x^2+10)\,dx$$

$$= \frac{1}{5}(x^3+10x)\Big|_{-4}^{1}$$

$$= \frac{1}{5}(1^3-(-4)^3+10(1-(-4)))$$

$$3c^2+10 = 23 \quad (2)$$

$$3c^2 = 13$$

$$c = \pm\sqrt{\frac{13}{3}}$$

$-\frac{1}{2}$ IF YOUR FINAL ANSWER INCLUDED BOTH $\pm\sqrt{\frac{13}{3}}$

$$c = -\sqrt{\frac{13}{3}} \in [-4,1] \quad (1)$$

Find the arc length function for the curve $y = \frac{1}{3}(4x^2-1)^{\frac{3}{2}}$ with starting point $(1, \sqrt{3})$. **SCORE: ___ / 6 POINTS**

Simplify your answer COMPLETELY.

$$s(x) = \int_1^x \sqrt{1+\left(\tfrac{1}{3}\cdot\tfrac{3}{2}(4t^2-1)^{\frac{1}{2}}\,8t\right)^2}\,dt \quad (1\tfrac{1}{2})$$

$$= \int_1^x \sqrt{1+(4t\sqrt{4t^2-1})^2}\,dt$$

$$= \int_1^x \sqrt{1+16t^2(4t^2-1)}\,dt$$

$$= \int_1^x \sqrt{1-16t^2+64t^4}\,dt \quad (2)$$

$$= \int_1^x (8t^2-1)\,dt \quad (1)$$

$$= \left(\tfrac{8}{3}t^3-t\right)\Big|_1^x \quad (\tfrac{1}{2})$$

$$= \frac{8}{3}x^3-x-\frac{5}{3} \quad (1)$$

The curve $x = 2\sqrt{y-1}$ for $y \in [5, 10]$ is revolved around the $y-$axis. **SCORE: ___ / 10 POINTS**

[a] Find the resulting surface area using a dy integral.

SEE 7:30 VERSION W

[b] Write, **BUT DO NOT EVALUATE**, a dx integral for the same surface area.

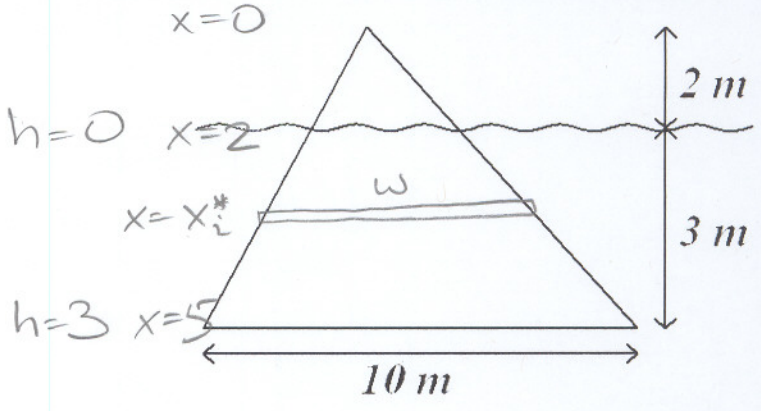
SEE 7:30 VERSION W

A vertical plate is partially submerged in water as shown on the right. Find the hydrostatic force on the plate. **SCORE: ___ / 7 POINTS**

NOTE: You MAY use the symbols ρ, δ and/or g in your final answers, if you write down their values underneath your answer.

$x - h = 2 \longrightarrow h = x - 2$

$\frac{w}{x_i^*} = \frac{10}{5} \rightarrow w = 2x_i^*$



$\int_2^5 (x-2)\rho g(2x)\,dx$

$= 2\rho g \int_2^5 (x^2 - 2x)\,dx$

$= 2\rho g \left(\frac{1}{3}x^3 - x^2\right)\Big|_2^5$

$= 2\rho g \left(\frac{1}{3}(5^3 - 2^3) - (5^2 - 2^2)\right)$

$= 2\rho g (39 - 21)$

$= 2\rho g (18)$

$= 36\rho g$ N

$\rho = 1000,\ g = 9.8$

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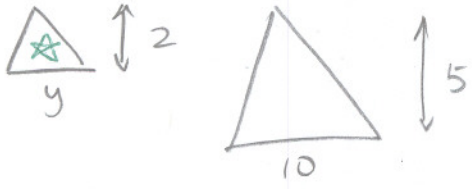
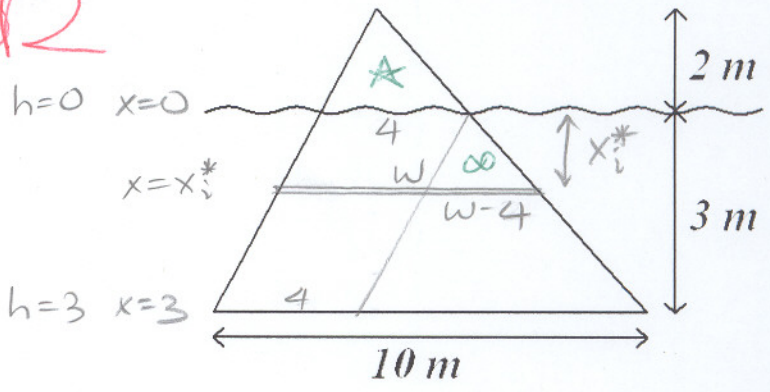
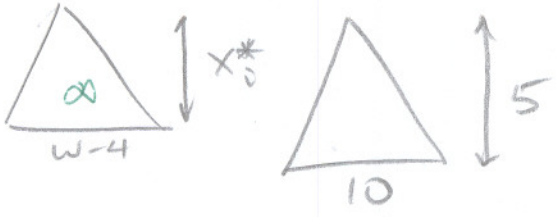
TOP



OR



$\frac{y}{2} = \frac{10}{5} \rightarrow y = 4$

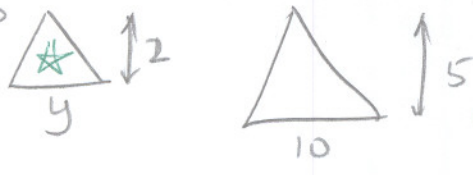


$\frac{w-4}{x_i^*} = \frac{10}{5} \rightarrow w = 2x_i^* + 4$

$$\int_0^3 x\rho g(2x+4)\,dx$$
$$= \rho g \int_0^3 (2x^2+4x)\,dx$$
$$= \rho g \left(\tfrac{2}{3}x^3 + 2x^2\right)\Big|_0^3$$
$$= \rho g \left(\tfrac{2}{3}(3)^3 + 2(3)^2\right)$$
$$= \rho g (18+18)$$
$$= 36\rho g \text{ N}$$

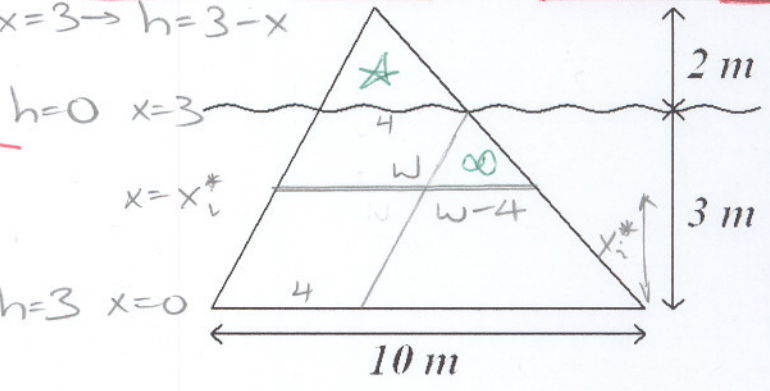
$\rho = 1000$, $g = 9.8$

TOP

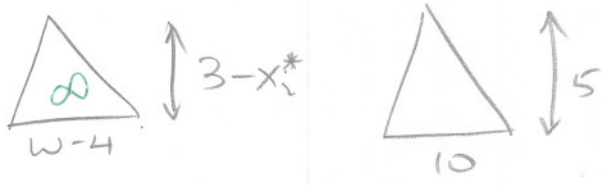


OR

$h + x = 3 \rightarrow h = 3 - x$



$\frac{y}{2} = \frac{10}{5} \rightarrow y = 4$



$\frac{w-4}{3-x_i^*} = \frac{10}{5} \rightarrow w = 10 - 2x_i^*$

$$\int_0^3 (3-x)\rho g(10-2x)\,dx$$
$$= \rho g \int_0^3 (30 - 16x + 2x^2)\,dx$$
$$= \rho g \left(30x - 8x^2 + \tfrac{2}{3}x^3\right)\Big|_0^3$$
$$= \rho g \left(30(3) - 8(3)^2 + \tfrac{2}{3}(3)^3\right)$$
$$= \rho g (90 - 72 + 18)$$
$$= 36\rho g \text{ N}$$

$\rho = 1000$, $g = 9.8$