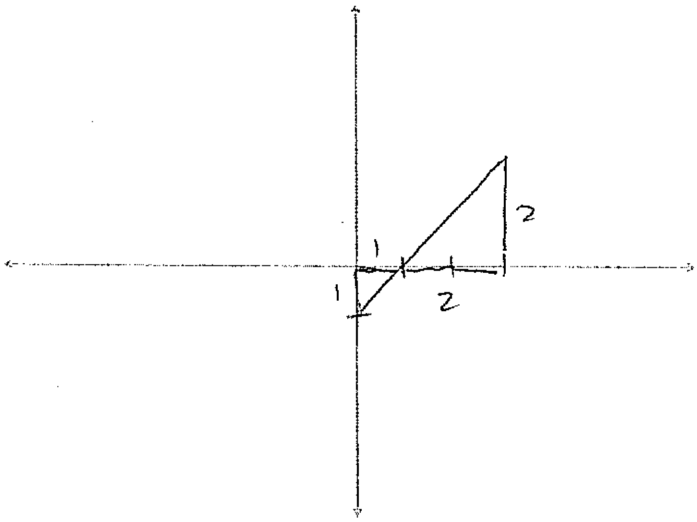
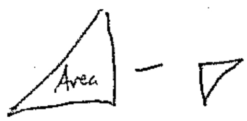
Quiz 1B, Calculus 2

Dr. Graham-Squire, Spring 2013

Name: Key

1. (3 points) Use formulas from geometry to find $\int_0^3 (x-1)\,dx$.



$\int_0^3 (x-1)\,dx =$ 

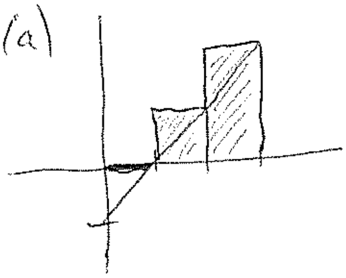
$= \frac{1}{2}(2\cdot 2) - \frac{1}{2}(1\cdot 1)$

$= 2 - \frac{1}{2}$

$= \boxed{1.5}$

2. (3 points) (a) Approximate $\int_0^3 (x-1)\,dx$ by calculating R_3 (that is, the Riemann sum using right endpoints with 3 subintervals).
(b) Compare your answer to question (1); that is, explain how your approximation is different from the actual value (if it is). A sketch of the approximation may help.

(a)



$R_3 = 1\cdot 0 + 1\cdot 1 + 1\cdot 2$

$R_3 = 3$

(b) R_3 is an overestimate, because the rectangles go above the curve.

3. (4 points) Use the Evaluation Theorem (that is, use an antiderivative) to evaluate the definite integral

$$\int_0^{3\pi/2} (\sin x + \sqrt{x})\,dx.$$

Simplify your answer but leave it in exact form (no decimal approximation needed).

$$\int_0^{3\pi/2} (\sin x + x^{1/2})\,dx = -\cos x + \frac{2}{3}x^{3/2}\Big|_0^{3\pi/2}$$

$$= -\cos\frac{3\pi}{2} + \frac{2}{3}\left(\frac{3\pi}{2}\right)^{3/2} - (-\cos 0 + 0)$$

$$= 0 + \frac{2}{3}\cdot\frac{3}{2}\pi\left(\sqrt{\frac{3\pi}{2}}\right) + 1$$

$$= \boxed{\pi\sqrt{\frac{3\pi}{2}} + 1} \quad \text{or} \quad \boxed{\frac{2}{3}\left(\frac{3\pi}{2}\right)^{3/2} + 1}$$

Quiz 1A, Calculus 2

Dr. Graham-Squire, Spring 2013

3:18

Name: Key

1. (4 points) Use the Evaluation Theorem (that is, use an antiderivative) to evaluate the definite integral

$$\int_0^{\pi/2} (\sqrt{x} - \sin x)\, dx.$$

Simplify your answer but leave it in exact form (no decimal approximation needed).

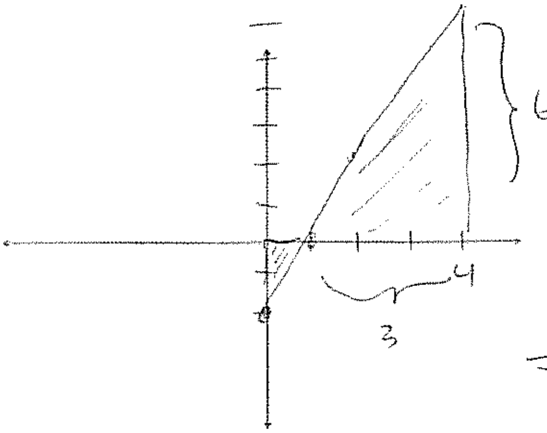
$$\int_0^{\pi/2} (\sqrt{x} - \sin x)\, dx = \frac{2}{3}x^{3/2} - (-\cos x)\Big|_0^{\pi/2}$$

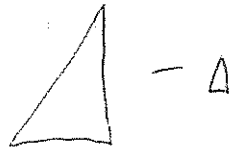
$$= \frac{2}{3}\left(\frac{\pi}{2}\right)^{3/2} + \cos \pi/2 - (0 + \cos 0)$$

$$= \frac{2}{3} \cdot \frac{\pi}{2}\sqrt{\frac{\pi}{2}} + 0 - 1$$

$$= \boxed{\frac{\pi}{3}\sqrt{\frac{\pi}{2}} - 1} \qquad \text{or } \frac{2}{3}\left(\frac{\pi}{2}\right)^{3/2} - 1$$

2. (3 points) Use formulas from geometry to find $\int_0^4 (2x-2)\,dx$.

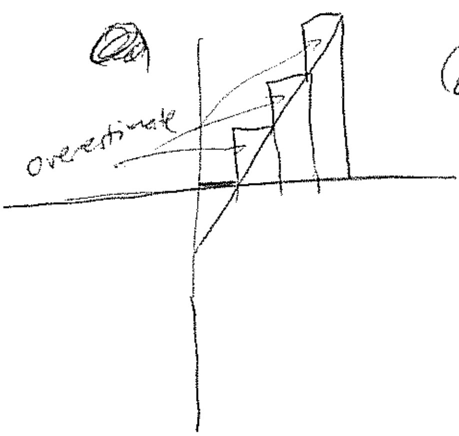




$\frac{1}{2}(6\cdot 3) - \frac{1}{2}(2\cdot 1)$

$= 9 - 1 = \boxed{8}$

3. (3 points) (a) Approximate $\int_0^4 (2x-2)\,dx$ by calculating R_4 (that is, the Riemann sum using right endpoints with 4 subintervals).
(b) Compare your answer to question (2); that is, explain how your approximation is different from the actual value (if it is). A sketch of the approximation may help.



(a) $R_4 = 1(0+2+4+6) = \boxed{12}$

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(b) The actual area is less than 12 because the rectangles give an <u>overestimate</u>.