Minitest 1A - MTH 1420

Dr. Graham-Squire, Spring 2013

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3:03

Name: Key

I pledge that I have neither given nor received any unauthorized assistance on this exam.

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(*signature*)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
2. Clearly indicate your answer by putting a box around it.
3. Cell phones and computers are <u>not</u> allowed on this test. Calculators <u>are</u> allowed on the first —— questions of the test, however you should still show all of your work. No calculators are allowed on the last —— questions of the test.
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. Make sure you sign the pledge.
6. Number of questions = 6. Total Points = 40.

2. (6 points) Calculate the definite integral

$$\int_1^4 \frac{x-3}{\sqrt{x}}\,dx.$$

$= \int_1^4 \left(\frac{x}{\sqrt{x}} - \frac{3}{\sqrt{x}}\right) dx$ ✓

$= \int_1^4 \left(x^{1/2} - 3x^{-1/2}\right) dx$ ✓

$= \frac{2}{3}x^{3/2} - 6x^{1/2}\Big|_1^4$ ✓✓

$= \frac{2}{3}(4^{3/2}) - 6(4)^{1/2} - \left(\frac{2}{3} - 6\right)$ ✓

$= \frac{16}{3} - 12 - \frac{2}{3} + 6$

$= \frac{14}{3} - 6 = \boxed{-\frac{4}{3}}$ ✓

No Calculator

Name: Key Test A

4. (6 points) Calculate $h'(x)$ for $h(x) = \int_0^{\sqrt{x}} e^{t^2}\,dt$. Show your work and explain your reasoning. At some point you need to use the fundamental theorem of calculus, so make sure you state where you use it.

Let $A(t)$ be an antiderivative of e^{t^2}. ✓

Then $h(x) = A(t)\Big|_0^{\sqrt{x}} = A(\sqrt{x}) - A(0)$ by the 2nd part of the FTC. ✓

So $h'(x) = \frac{d}{dx}\left(A(\sqrt{x}) - A(0)\right)$ ✓

$= A'(\sqrt{x}) \cdot \frac{1}{2}x^{-1/2} - 0$ ✓

$= e^{(\sqrt{x})^2} \cdot \frac{1}{2\sqrt{x}}$

$= \boxed{\frac{e^x}{2\sqrt{x}}}$ ✓✓

6. (6 points) Solve the integral $\int_0^{\pi} x \sin x \, dx$.

$u = x \quad dv = \sin x \, dx$

$du = dx \quad v = -\cos x$ ✓✓✓

$= -x\cos x \Big|_0^{\pi} + \int_0^{\pi} \cos x \, dx$ ✓

$= -\pi \cos\pi + 0 \cdot \cos 0 + \sin x \Big|_0^{\pi}$ ✓

$= \pi + 0 + \underbrace{\sin\pi}_{=0} - \underbrace{\sin 0}_{=0}$ ✓

$= \boxed{\pi}$

Extra Credit(1 point) Calculate $\int e^x \, dt$. Hint: read the integral carefully.

$= \boxed{e^x \cdot t + C}$

Minitest 1B - MTH 1420

Dr. Graham-Squire, Spring 2013

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(*signature*)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
2. Clearly indicate your answer by putting a box around it.
3. Cell phones and computers are <u>not</u> allowed on this test. Calculators <u>are</u> allowed on the first 3 questions of the test, however you should still show all of your work. No calculators are allowed on the last 3 questions of the test.
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. Make sure you sign the pledge.
6. Number of questions = 6. Total Points = 40.

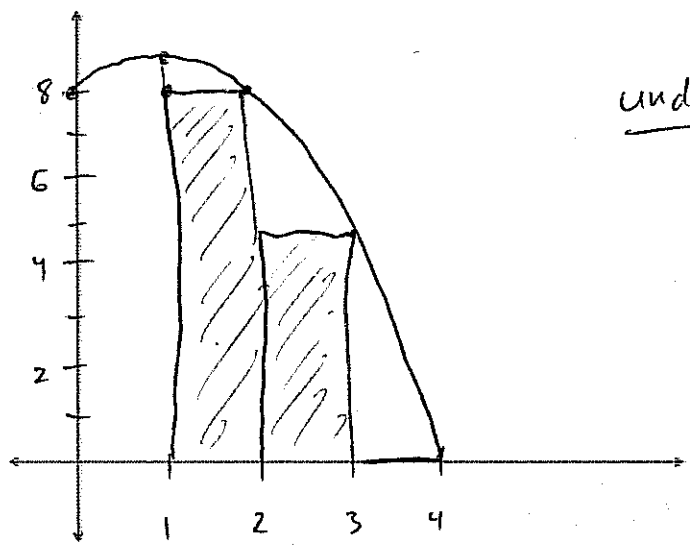
3. (8 points) (a) Calculate R_3 (the approximate area using three rectangles and the right endpoint to evaluate) to approximate the area under the graph of $f(x) = -x^2+2x+8$, from $x = 1$ to $x = 4$.

(a) $R_3 = 1 \cdot f(2) + 1 \cdot f(3) + 1 \cdot f(4)$

$= 1 \cdot 8 + 1 \cdot 5 + 1 \cdot 0$

$= \boxed{13}$

(b) Sketch a graph of $f(x) = -x^2 + 2x + 8$ and draw in the rectangles you are using to calculate R_3. Is R_3 an under-approximation or an over-approximation?



under-approximation.

No Calculator

Name: Key

Test B

4. (8 points) Calculate $\int \tan x \ln(\cos x)\, dx$.

$= \int \frac{\sin x}{\cos x} \ln(u) \left(\frac{du}{-\sin x}\right)$ ✓

$= -\int \frac{\ln(u)}{u}\, du$ ✓

$= -\int v\, dv$

$= -\frac{1}{2} v^2 + C$ ✓

$= -\frac{1}{2}\left(\ln(\cos x)\right)^2 + C$ ✓

$u = \cos x$ ✓✓

$du = -\sin x\, dx$ ✓

$\frac{du}{-\sin x} = dx$

$v = \ln u$

$dv = \frac{1}{u}\, du$ ✓

Note: could also do $u = \ln(\cos x)$ at the start

6. (6 points) Calculate $h'(x)$ for $h(x) = \int_0^{\sqrt{x}} e^{t^3}\,dt$. Show your work and explain your reasoning. At some point you need to use the fundamental theorem of calculus, so make sure you state where you use it.

Let $f(t) = e^{t^3}$ and $F(t)$ be an antiderivative.

Then $h(x) = \int_0^{\sqrt{x}} e^{t^3}\,dt$ ✓

$= F(t)\Big|_0^{\sqrt{x}}$ → This is the fundamental theorem of Calculus

$= F(\sqrt{x}) - F(0)$ ✓

$\Rightarrow h'(x) = \frac{d}{dx}\left(F(\sqrt{x}) - F(0)\right)$ ✓

$= F'(\sqrt{x}) \cdot \frac{1}{2}x^{-1/2}$ ✓

$= \frac{e^{(\sqrt{x})^3}}{2\sqrt{x}} = \boxed{\frac{e^{(x^{3/2})}}{2\sqrt{x}}}$ ✓✓

Extra Credit(1 point) Calculate $\int e^x\,dt$. Hint: read the integral carefully.

$= \boxed{e^x \cdot t + C}$