MATH 11012 | Intuitive Calculus | Spring 2011
Circle one: 8:50 5:30 | Ms. Kracht

Name: KEY Quiz Score: /25

Quiz 4: Version A

Show your reasoning. Use standard notation correctly. Simplify your answers.

Evaluate each integral, simplifying your answer. If you use a substitution, write it out explicitly, along with the computation of the differential. Check your answer.

1. $\int \left(\frac{1}{\sqrt[3]{y^2}} - \frac{5}{y}\right) dy$

$= \int \left(y^{-2/3} - \frac{5}{y}\right) dy$

$= 3y^{1/3} - 5\ln|y| + C$

Check: $\frac{d}{dy}\left(3y^{1/3} - 5\ln(y) + C\right)$

$= 3 \cdot \frac{1}{3} y^{-2/3} - 5 \cdot \frac{1}{y} + 0$

$= \frac{1}{\sqrt[3]{y^2}} - \frac{5}{y}$ ✓

integral: /4 check: /2 notation: /2

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2. $\int e^{0.02t} dt$

$= \frac{1}{0.02} e^{0.02t} + C$

$= \frac{100}{2} e^{0.02t} + C$

$= 50 e^{0.02t} + C$

Check: $\frac{d}{dt}\left(50 e^{0.02t} + C\right)$

$= 50(0.02) e^{0.02t} + 0$

$= e^{0.02t}$ ✓

integral: /4 check: /2 notation: /2

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3. $\int \sqrt{x^2 - 6x + 2}\,(x-3)\,dx$

let $u = x^2 - 6x + 2$

then $\frac{du}{dx} = 2x - 6$

$du = 2(x-3)\,dx$

$\frac{1}{2} du = (x-3)\,dx$

$= \int u^{1/2} \left(\frac{1}{2}\right) du$

$= \frac{1}{2} \cdot \left(\frac{2}{3} u^{3/2}\right) + C$

$= \frac{1}{3} u^{3/2} + C$

$= \frac{1}{3} (x^2 - 6x + 2)^{3/2} + C$

Check: $\frac{d}{dx}\left(\frac{1}{3}(x^2-6x+2)^{3/2} + C\right)$

$= \frac{1}{3} \cdot \frac{3}{2} (x^2-6x+2)^{1/2} (2x-6)$

$= \sqrt{x^2-6x+2} \cdot \frac{1}{2}(2x-6)$

$= \sqrt{x^2-6x+2}\,(x-3)$ ✓

integral: /6 check: /2 notation: /2

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Quiz 4: Version B

Show your reasoning. Use standard notation correctly. Simplify your answers.

Evaluate each integral, simplifying your answer. If you use a substitution, write it out explicitly, along with the computation of the differential. Check your answer.

1. $\int \left(\frac{1}{\sqrt[4]{x^3}} - \frac{2}{x}\right) dx = \int \left(x^{-3/4} - \frac{2}{x}\right) dx$

$= 4x^{1/4} - 2\ln|x| + C$

Check: $\frac{d}{dx}\left(4 \cdot x^{1/4} - 2\ln x + C\right)$

$= 4 \cdot \frac{1}{4} x^{-3/4} - 2 \cdot \frac{1}{x} + 0$

$= \frac{1}{\sqrt[4]{x^3}} - \frac{2}{x}$ ✓

integral: /4 check: /2 notation: /2

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2. $\int e^{0.05y} dy = \frac{1}{0.05} e^{0.05y} + C$

$= \frac{100}{5} e^{0.05y} + C$

$= 20 e^{0.05y} + C$

Check: $\frac{d}{dy}\left(20 e^{0.05y} + C\right)$

$= 20(0.05) e^{0.05y}$

$= e^{0.05y}$ ✓

integral: /4 check: /2 notation: /2

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3. $\int \sqrt{t^2 - 8t - 11}\,(t-4)\,dt$

Let $u = t^2 - 8t - 11$

Then $\frac{du}{dt} = 2t - 8$

$du = (2t-8)\,dt$

$du = 2(t-4)\,dt$

$\frac{1}{2} du = (t-4)\,dt$

$= \int \sqrt{u} \cdot \frac{1}{2} du$

$= \frac{1}{2} \int u^{1/2} du$

$= \frac{1}{2} \cdot \frac{2}{3} u^{3/2} + C$

$= \frac{1}{3}(t^2 - 8t - 11)^{3/2} + C$

Check: $\frac{d}{dt}\left(\frac{1}{3}(t^2 - 8t - 11)^{3/2} + C\right)$

$= \frac{1}{3} \cdot \frac{3}{2}(t^2 - 8t - 11)^{1/2}(2t - 8)$

$= \frac{1}{2}(t^2 - 8t - 11)^{1/2}(2t - 8)$

$= \sqrt{t^2 - 8t - 11}\,(t - 4)$ ✓

integral: /6 check: /2 notation: /2

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Quiz 4: Version C

Show your reasoning. Use standard notation correctly. Simplify your answers.

Evaluate each integral, simplifying your answer. If you use a substitution, write it out explicitly, along with the computation of the differential. Check your answer.

1. $\int \left(\frac{1}{\sqrt[5]{w^4}} - \frac{10}{w}\right) dw = \int \left(w^{-4/5} - \frac{10}{w}\right) dw$

$= 5w^{\frac{1}{5}} - 10\ln|w| + C$

Check: $\frac{d}{dw}\left(5w^{1/5} - 10\ln w + C\right)$

$= 5 \cdot \frac{1}{5} w^{-4/5} - 10 \cdot \frac{1}{w}$

$= \frac{1}{\sqrt[5]{w^4}} - \frac{10}{w}$ ✓

integral: /4 check: /2 notation: /2

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2. $\int e^{0.03t} dt = \frac{1}{0.03} e^{0.03t} + C$

$= \frac{100}{3} e^{0.03t} + C$

Check: $\frac{d}{dt}\left(\frac{100}{3} e^{0.03t} + C\right)$

$= \frac{100}{3}(0.03) e^{0.03t}$

$= e^{0.03t}$ ✓

integral: /4 check: /2 notation: /2

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3. $\int \sqrt{x^2 + 12x - 500}\,(x+6)\,dx$

Let $u = x^2 + 12x - 500$

Then $\frac{du}{dx} = 2x + 12$

$du = 2(x+6)\,dx$

$\frac{1}{2} du = (x+6)\,dx$

$= \int \sqrt{u} \cdot \frac{1}{2} du$

$= \frac{1}{2} \int u^{1/2} du$

$= \frac{1}{2} \cdot \left(\frac{2}{3} u^{3/2}\right) + C$

$= \frac{1}{3}\left(x^2 + 12x - 500\right)^{3/2} + C$

Check:

$\frac{d}{dx}\left(\frac{1}{3}(x^2+12x-500)^{3/2} + C\right)$

$= \frac{1}{3} \cdot \frac{3}{2} (x^2+12x-500)^{1/2}(2x+12)$

$= \frac{1}{2}(x^2+12x-500)^{1/2} 2(x+6)$

$= \sqrt{x^2+12x-500}\,(x+6)$ ✓

integral: /6 check: /2 notation: /2

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Quiz 4: Version D

Show your reasoning. Use standard notation correctly. Simplify your answers.

Evaluate each integral, simplifying your answer. If you use a substitution, write it out explicitly, along with the computation of the differential. Check your answer.

1. $\int \left(\frac{1}{\sqrt[3]{x^4}} - \frac{8}{x}\right) dx$

$= \int \left(x^{-4/3} - \frac{8}{x}\right) dx$

$= -3x^{-1/3} - 8\ln|x| + C$

Check: $\frac{d}{dx}\left(-3x^{-1/3} - 8\ln x + C\right)$

$= -3\left(-\frac{1}{3}\right)x^{-4/3} - 8\left(\frac{1}{x}\right)$

$= x^{-4/3} - \frac{8}{x}$

$= \frac{1}{\sqrt[3]{x^4}} - \frac{8}{x}$ ✓

integral: /4 check: /2 notation: /2

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2. $\int e^{0.06t} dt$

$= \frac{1}{0.06} e^{0.06t} + C$

$= \frac{100}{6} e^{0.06t} + C$

$= \frac{50}{3} e^{0.06t} + C$

Check: $\frac{d}{dt}\left(\frac{50}{3} e^{0.06t} + C\right)$

$= \frac{50}{3}(0.06) e^{0.06t}$

$= e^{0.06t}$ ✓

integral: /4 check: /2 notation: /2

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3. $\int \sqrt{y^2 - 100y + 1}\,(y - 50)\, dy$

Let $u = y^2 - 100y + 1$

$\frac{du}{dy} = 2y - 100$

$du = 2(y - 50)\, dy$

$\frac{1}{2} du = (y - 50) dy$

$= \int \sqrt{u} \cdot \frac{1}{2} du$

$= \frac{1}{2}\int u^{1/2} du$

$= \frac{1}{2} \cdot \left(\frac{2}{3} u^{3/2}\right) + C$

$= \frac{1}{3} u^{3/2} + C$

$= \frac{1}{3}\left(y^2 - 100y + 1\right)^{3/2} + C$

Check:

$\frac{d}{dy}\left[\frac{1}{3}\left(y^2 - 100y + 1\right)^{3/2} + C\right]$

$= \frac{1}{3} \cdot \frac{3}{2}\left(y^2 - 100y + 1\right)^{1/2}(2y - 100)$

$= \frac{1}{2}\left(y^2 - 100y + 1\right)^{1/2} 2(y - 50)$

$= \sqrt{y^2 - 100y + 1}\,(y - 50)$ ✓

integral: /6 check: /2 notation: /2