a) $\int_1^6 (t^2-2t-8)\,dt = \frac{1}{3}t^3-t^2-8t \Big|_1^6 = \left(\frac{6^3}{3}-36-48\right)-\left(\frac{1}{3}-1-\cancel{8}\right)$

$(-12)-\frac{1}{3}+9 = -10/3\ m$

MATH 151
Mrs. Bonny Tighe

QUIZ 9A

25 points
5.3,5.4,5.5

NAME Answers

Section________ Fri. 4/28/06

1. The velocity function, in meters per second, is given for a particle moving along a curve. Find a) the displacement and b) the total distance traveled by the particle during the given time interval. $v(t) = t^2 - 2t - 8$, $1 \le t \le 6$

$(t-4)(t+2)=0 \rightarrow \frac{1}{3}t^3-t^2-8t\Big|_1^4 + \frac{1}{3}t^3-t^2-8t\Big|_4^6 =$

$\left|\left(\frac{64}{3}-16-32\right)-\left(\frac{1}{3}-9\right)\right| + \left|(72-36-48)-\left(\frac{64}{3}-16-32\right)\right|$

$(-25\,2/3-\frac{1}{3}+9)$ $\quad |-12 + 25\,2/3|$

$|-17| + |13\,2/3| = 30\,2/3\ m$

2. Evaluate the integral, if it exists, using substitution.

a) $\int (3x+x^3)^5(1+x^2)\,dx =$ ____________

$\frac{1}{3}\int u^5\,du$ $\quad u = 3x+x^3$

$du = 3+3x^2\,dx$

$3(1+x^2)\,dx$

$\frac{1}{3}\cdot\frac{1}{6}u^6+C$

$\frac{1}{18}(3x+x^3)^6+C$

b) $\int \frac{1}{x^2}\sqrt{1+\frac{1}{x}} =$ $-\frac{2}{3}\left(1+\frac{1}{x}\right)^{3/2}+C$

$u = 1+x^{-1}$

$du = -x^{-2}dx$

$-\frac{1}{x^2}dx$

$-\int u^{1/2}\,du$

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

c) $\int\sqrt{5-3x}\,dx =$ $-\frac{2}{9}(5-3x)^{3/2}+C$

$u = 5-3x$

$du = -3\,dx$

$-\frac{1}{3}\int u^{1/2}\,du$

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

$-2/9(5-3x)^{3/2}+C$

d) $\int \csc^4 3\alpha\cot 3\alpha\,d\alpha =$ ____________

$\int \csc^3 3\alpha\,\csc 3\alpha\cot 3\alpha\,d\alpha$ $\quad u = \csc 3\alpha$

$du = -3\csc 3\alpha\cot 3\alpha$

$-\frac{1}{3}\int u^3\,du$

$-\frac{1}{3}\cdot\frac{1}{4}u^4+C = -\frac{1}{12}\csc^4 3\alpha + C$

e) $\int_0^{\pi/2} (\cos^3\alpha)\sin\alpha\,d\alpha =$ _______

$u = \cos\alpha$

$du = -\sin\alpha\,d\alpha$

$-\int u^3\,du$

$-\frac{1}{4}u^4\Big|_0^{\pi/2}$

$-\frac{1}{4}\cos^4\alpha\Big|_0^{\pi/2} =$

$-\frac{1}{4}(\cos\pi/2)^4 + \frac{1}{4}(\cos 0)^4$

$0+\frac{1}{4} = \frac{1}{4}$

f) $\int \frac{\sec^2\sqrt{x}}{\sqrt{x}}\,dx =$ ____________

$u = \sqrt{x}$

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

$2\int \sec^2 u\,du$

$2\tan u + C$

$2\tan\sqrt{x}+C$

3. Find the general ~~indefinite integral~~.

a) $\int \frac{2}{x^2\sqrt{x}}dx =$ $\frac{-4}{3x^{3/2}} + C$

$\int 2x^{-5/2}dx$

$2 \cdot \frac{1}{-3/2} x^{-3/2} + C$

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

b) $\int (x^2-2)^2 dx =$ _________

$\int (x^4 - 4x^2 + 4)\,dx$

$\frac{1}{5}x^5 - \frac{4}{3}x^3 + 4x + C$

c) $\int \frac{\sin 2\phi}{\sin\phi} d\phi =$ $2\sin\phi + C$

$\int \cancel{\frac{2\sin\phi\cos\phi\,d\phi}{\sin\phi}}$

$\int 2\cos\phi\, d\phi = +2\sin\phi + C$

d) $\int (3 + \frac{2}{x^2} + \cos x)dx =$ _________

$3 + 2x^{-2} + \cos x$

$3x + 2\cdot\frac{1}{-1}x^{-1} + \sin x + C$

$3x - \frac{2}{x} + \sin x + C$

4. Use the Fundamental Theorem of Calculus Part I to find the derivative for the following:

a) $\int_x^5 (p - \sqrt{p})dp =$ _________

$-(x - \sqrt{x})$ or $\sqrt{x} - x$

b) $\int_2^{\tan x} (4m + 3\tan m)^2 dm =$ _________

$(4\tan x + 3\tan(\tan x))^2 \cdot \sec^2 x$

5. Use the Fundamental Theorem of Calculus Part II to evaluate the integral, or explain why it doesn't exist.

a) $\int_0^{\pi/4} \sec x \tan x dx =$ $\sqrt{2} - 1$

$\sec x \Big|_0^{\pi/4}$

$\sec \pi/4 - \sec 0$

$\sqrt{2} - 1$

b) $\int_0^4 x\sqrt{x}(x-1)dx =$ _________

$\int_0^4 (x^{5/2} - x^{3/2})dx =$

$\frac{1}{7/2}x^{7/2} - \frac{1}{5/2}x^{5/2}\Big|_0^4 =$

$\left(\frac{2}{7}(4)^{7/2} - \frac{2}{5}(4)^{5/2}\right) - \left(\frac{2}{7}0 - \frac{2}{5}0\right)$

$\frac{256}{7} - \frac{64}{5}$