MAC2311 Test 4 Name Key

You may use your calculator to **check** the definite integrals. **However, all work must be shown to find the definite integrals without using the calculator.**

1. $\int_0^4 (3 + x\sqrt{x})\,dx = \int_0^4 (3 + x^{3/2})\,dx$

$= 3x + x^{5/2} \cdot \frac{2}{5}$

$= \left(3x + \frac{2}{5}x^{5/2}\right)\Big|_0^4$

$= 3(4) + \frac{2}{5}(4)^{5/2} - \left(3(0) + \frac{2}{5}(0)^{5/2}\right)$

$= 12 + \frac{2}{5}(2)^5 - (0 + 0)$

$= 12 + \frac{64}{5} = \frac{60}{5} + \frac{64}{5}$

$= \boxed{\frac{124}{5}} = 24.8$

2. $\int \left(\frac{x+5x^7}{x^3}\right) dx = \int \left(\frac{x}{x^3} + \frac{5x^7}{x^3}\right) dx$

$= \int (x^{-2} + 5x^4)\,dx$

$= \frac{x^{-1}}{-1} + 5\frac{x^5}{5}$

$= \boxed{\frac{-1}{x} + x^5 + C}$

3. $\int (x-1)(3x+2)\,dx = \int (3x^2+2x-3x-2)\,dx$

$= \int (3x^2 - x - 2)\,dx$

$= \frac{3x^3}{3} - \frac{x^2}{2} - 2x$

$= \boxed{x^3 - \frac{1}{2}x^2 - 2x + C}$

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

$u = 1+2x$

$du = 2\,dx$

$\frac{du}{2} = dx$

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

$= \frac{1}{2}\,u^{1/3} \cdot \frac{3}{1} = \boxed{\frac{3}{2}(1+2x)^{1/3} + C}$

5. $\int_{\pi/4}^{\pi/3} \csc x \cot x \, dx$ $= (-\csc x)\Big|_{\pi/4}^{\pi/3}$

$\frac{\pi}{3}\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

$\frac{\pi}{4}\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

$= -\csc\left(\frac{\pi}{3}\right) - -\csc\left(\pi/4\right)$

$= \boxed{-\frac{2}{\sqrt{3}} + \frac{2}{\sqrt{2}}} = \frac{-2\sqrt{2} + 2\sqrt{3}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{-2\sqrt{12} + 2\sqrt{18}}{6}$

$= \frac{-4\sqrt{3} + 6\sqrt{2}}{6} = \boxed{-\frac{2}{3}\sqrt{3} + \sqrt{2}} \approx .2595\,13024$

6. $\int \cos x \sin^6 x \, dx$

$u = \sin x$

$du = \cos x \, dx$

$= \int u^6 \, du$

$= \frac{u^7}{7} = \frac{1}{7}(\sin x)^7 = \boxed{\frac{1}{7}\sin^7 x + C}$

7. A radar gun was used to record the speed of a runner at times given in the table. Use **five right rectangles** to approximate the distance the runner covered during those five seconds.

Time (sec)	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Velocity (m/s)	0	4.67	7.34	8.86	9.73	10.22	10.51	10.67	10.76	10.81	10.81

$\Delta x = \frac{5}{5} = 1$

$A = 1(7.34) + 1(9.73) + 1(10.51) + 1(10.76) + 1(10.81)$

$\boxed{A = 49.15 \text{ m}}$

8. $\frac{d}{dx}\int_0^x \sqrt{1+t^3}\,dt$ Fundamental Th. of Calc

$= \boxed{\sqrt{1+x^3}}$

9. $\frac{d}{dx}\int_0^3 \sqrt{1+t^3}\,dt$ Derivative of Constant

$= \boxed{0}$

10. $\int_{-1}^{1} \tan^3 x\,dx$ ODD Function

$= \boxed{0}$