AP Calculus Ch. 4 Test

1. $\int (-4x-4)\,dx$

$= -4\int x+1\,dx$

$= -4\left(\frac{x^2}{2}+x+C\right)$

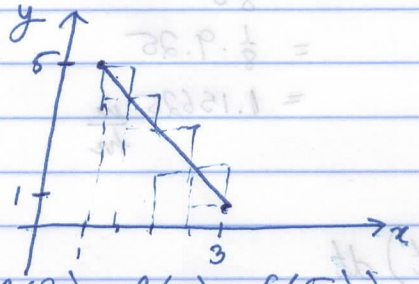
$= -2x^2-4x+C.$ **B**

2. $\int 2\sin(4x+1)\,dx = \frac{-2\cos(4x+1)}{4}$

$= -\frac{1}{2}\cos(4x+1)+C.$ **C.**

3. $f(x) = -2x+7 \quad [1,3]$

$\Delta x = \frac{3-1}{4} = \frac{1}{2}$



Area = ~~$f(1)$~~ $\Delta x\left(f(1)+f\left(\frac{3}{2}\right)+f(2)+f\left(\frac{5}{2}\right)\right)$

$= \frac{1}{2}[5+4+3+2]$

$= \frac{1}{2}\cdot 14$

$= 7.$ **D.**

4. $\int_3^5 (-2x^2+12x-13)\,dx$

$= \frac{-2x^3}{3}+\frac{12x^2}{2}-13x\Big|_3^5 = \frac{5}{3}-(-3) = \frac{14}{3}.$ **A.**

~~$\frac{\quad}{3}-(\quad)$~~ 0

$=$ ~~$\frac{\quad}{3}$~~ ~~$\frac{\quad}{3}$~~

5. $\int_{\pi/3}^{\pi/2} \sin 2\theta \, d\theta = -\frac{1}{2}\cos(2\theta)\Big|_{\pi/3}^{\pi/2}$

$= -\frac{1}{2}\left[(-1) - \left(-\frac{1}{2}\right)\right]$

$= -\frac{1}{2}\left(-\frac{1}{2}\right) = \frac{1}{4}.$

6.

t	0	2	3	5	8
$R(t)$	0	2	2.5	1	.25

~~$\int_0^8 R(t)\,dt$~~ $\frac{1}{8}\int_0^8 R(t)\,dt$

$\approx \frac{1}{8}\left[2(2) + 1(2.5) + 2(1) + 3(.25)\right]$

$= \frac{1}{8}\left[4 + 2.5 + 2 + \frac{3}{4}\right]$

$= \frac{1}{8} \cdot 9.25$

$= 1.15625 \frac{in}{hr}$

7. $\int_1^4 (6t^2 - 4t)\,dt$

$= 2t^3 - 2t^2\Big|_1^4$

$= 96 - 0 = 96\ mm$

8. $\int_0^8 f(x)\,dx$

$= 8 \times 3 + \frac{1}{2}\pi \cdot 4^2$

$= 24 + 8\pi$

9. $\int x\sqrt{2x-3}\,dx$ Let $u = 2x-3$, $du = 2\,dx$, $dx = \frac{du}{2}$, $x = \frac{u-3}{2}$

$= \int \frac{u-3}{2}\sqrt{u}\,\frac{du}{2}$

$= \frac{1}{4}\int u^{3/2} - 3u^{1/2}\,du$

$= \frac{1}{4}\left[\frac{2}{5}u^{5/2} - 3\cdot\frac{2}{3}u^{3/2}\right]$

$= \frac{1}{10}u^{5/2} - 2u^{3/2} + C.$

$= \frac{(2x-3)^{5/2}}{10} - 2(2x-3)^{3/2} + C$

10. $\int_1^3 x(x^2-6)^2\,dx$ Let $u = x^2-6$, $du = 2x\,dx$, $u(1) = -5$, $u(3) = 3$

$= \frac{1}{2}\int_{-5}^{3} u^2\,du$

$= \frac{1}{2}\left[\frac{u^3}{3}\right]_{-5}^{3}$

$= \frac{1}{6}\left[u^3\right]_{-5}^{3}$

$= \frac{1}{6}\left[27 - (-125)\right]$

$= \frac{152}{6}$

$= \frac{76}{3} \approx 25.333.$

11. $\int \frac{4\sin(-2x)}{\cos^3(-2x)}\,dx$ Let $u = \cos(-2x)$, $du = +2\sin(-2x)\,dx$

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

$= 2\left[\frac{u^{-2}}{-2}\right] = -\frac{1}{u^2} = -\frac{1}{\cos^2(-2x)} + C$

Bonus) $\int (x^2-5)\,dx \qquad h(1)=9$

$= \frac{x^3}{3} - 5x + C = h(x)$

If $h(1) = 9$

$\frac{1^3}{3} - 5(1) + C = 9$

$C = 9 - \frac{1}{3} + 5$

$= 13\frac{2}{3}.$