H.W. #4 Solution Key:

5.3 # 4, 10, 14, 18, 20, 28, 45, 48, 50, 52, 60

4-) $\int_{-2}^{0} (u^5 - u^3 + u^2)\,du = \int_{-2}^{0} u^5\,du - \int_{-2}^{0} u^3\,du + \int_{-2}^{0} u^2\,du$

$= \frac{u^6}{6}\Big|_{-2}^{0} - \frac{u^4}{4}\Big|_{-2}^{0} + \frac{u^3}{3}\Big|_{-2}^{0}$

Applying the Net change theorem ($\int_a^b F'(x)\,dx = F(b) - F(a)$):

$\int_{-2}^{0} (u^5 - u^3 + u^2)\,du = -\left(\frac{128 - 48 - 32}{12}\right) = -\left(\frac{48}{12}\right) = -4$

10-) $\int_0^4 (2v+5)(3v-1)\,dv = \int_0^4 (6v^2 + 13v - 5)\,dv = \int_0^4 6v^2 + \int_0^4 13v\,dv - \int_0^4 5\,dv$

$= \frac{6v^3}{3}\Big|_0^4 + \frac{13v^2}{2}\Big|_0^4 - 5v\Big|_0^4$

Mimicking the procedure in problem 4-):

$\int_0^4 (2v+5)(3v-1)\,dv = 128 + 104 - 20 = 212$

14-) $\int_1^9 \frac{3x-2}{\sqrt{x}}\,dx$

Apply the algebra first, then integrate:

$\int_1^9 \frac{3x-2}{\sqrt{x}}\,dx = \int_1^9 3x^{1/2}\,dx - \int_1^9 2x^{-1/2}\,dx = 2x^{3/2}\Big|_1^9 - 4x^{1/2}\Big|_1^9 = (2(27) - 12 - (2-4)) = 44$

18-) $\int_0^1 10^x\,dx$

Using the table in pg. 369; (We can easily derive this by using $\frac{d}{dx} a^x = a^x \ln a$, where a is a constant)

$\int_0^1 10^x\,dx = \frac{10^x}{\ln 10}\Big|_0^1 = \frac{10^1 - 10^0}{\ln 10} = \boxed{\frac{9}{\ln 10}}$

20-) $\int_0^1 \frac{4}{t^2+1}\,dt$

Again, referring to pg. 369:

$\int_0^1 \frac{4}{t^2+1}\,dt = 4\tan^{-1}(t)\Big|_0^1 = 4(\tan^{-1}(1) - \tan^{-1}(0))$

Using:  $\rightarrow \tan^{-1}(1) = \frac{\pi}{4}$ & $\tan^{-1}(0) = 0 \rightarrow$ So $\int_0^1 \frac{4}{t^2+1}\,dt = 4\left(\frac{\pi}{4}\right) = \pi$