Math 152 Quiz #2 Answers

1. Area $= \displaystyle\int_1^5 \frac{5}{x^2} + 2\,dx = -5x^{-1} + 2x\,|_1^5$

$= -1 + 10 - (-5 + 2)$

$= \boxed{12}$

2. $\displaystyle\int x^3(1-5x)\,dx = \int x^3 - 5x^4\,dx = \boxed{\tfrac{1}{4}x^4 - x^5 + C}$

3. Since $v(t) = 12 - 4t$ is positive for $t < 3$ and negative for $t > 3$, we have that

Distance traveled $= \displaystyle\int_0^5 |12 - 4t|\,dt = \int_0^3 12 - 4t\,dt + \int_3^5 -(12 - 4t)\,dt$

$= [12t - 2t^2]_0^3 - [12t - 2t^2]_3^5$

$= 18 - (-8)$

$= \boxed{26 \text{ km}}$

(Note: You can also easily evaluate this integral by looking at the graph of $v(t)$.)

4. Let $u = 2t^3 + 3 \quad \rightarrow \quad du = 6t^2\,dt \quad$ or $\quad \tfrac{1}{2}du = 3t^2\,dt$

Substitution in the integral: $\displaystyle\int \frac{3t^2}{2t^3+3}\,dt = \frac{1}{2}\int \frac{1}{u}\,du$

$= \tfrac{1}{2}\ln|u| + C$

$= \boxed{\tfrac{1}{2}\ln|2t^3+3| + C}$