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MATH 252X Calculus II
HWRK §1.2; # 1, 2, 3, 4, 5, 6

$\Rightarrow$ Indicates the beginning of work.

1. Evaluate the following definite integral:

$$\int_2^{40} \sqrt{x^2}\mathrm{d}x$$

$$\Rightarrow \frac{x^3}{3}\Big|_2^{40} = -\frac{2^3}{3} = \frac{64{,}000}{3} - \frac{8}{3}$$
$$= \boxed{\frac{63{,}992}{3} \approx 21{,}330.\overline{66}}$$

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2. Evaluate the following summation:

$$\sum_{n=0}^{5} n - 1$$

$$\Rightarrow (0-1) + (1-1) + (2-1) + (3-1) + (4-1) + (5-1)$$
$$= 4 + 3 + 2 + 1 + 0 - 1 = \boxed{9}$$

Use u substitution to evaluate the following integrals:

3.

$$\int 3x^2(x^3+1)^6\mathrm{d}x$$

$$\Rightarrow u = x^3 + 1 \quad \mathrm{d}u = (3x^2)\mathrm{d}x$$

$$\int u^6\mathrm{d}u = \boxed{\frac{u^7}{7} + C = \frac{(x^3+1)^7}{7} + C}$$

4.

$$\int e^{2x}\mathrm{d}x$$

$$\Rightarrow u = 2x \qquad 12\mathrm{d}u = \mathrm{d}x$$

$$\frac{1}{2}\int e^u\mathrm{d}u = \boxed{\frac{e^u}{2} + C = \frac{e^{2x}}{2} + C}$$

5.

$$\int \frac{6x}{(5+3x^2)^4}\mathrm{d}x$$

$$\Rightarrow u = 5 + 3x^2 \quad \mathrm{d}u = 6x\mathrm{d}x$$

$$= \int \tfrac{1}{u^4}\mathrm{d}u = \int u^{-4}\mathrm{d}u = \boxed{-\frac{u^{-3}}{3} + C = -\frac{(5+3x^2)^{-3}}{3} + C}$$

6.

$$\int \frac{4\sin(x)}{3+\cos(x)}\mathrm{d}x$$

$$\Rightarrow u = 3 + \cos(x) \quad \mathrm{d}u = -\sin(x)\mathrm{d}x$$

$$-4\int \frac{1}{u}\mathrm{d}u = \boxed{-4\ln|u| + C = -4\ln|3+\cos(x)| + C}$$
