Name: Key

Show your work. Answers without work earn reduced credit.

1. **[2 parts, 1 point each]** At time t, water leakes from a pool at the rate of $r(t) = 3e^{-2t}$ gallons per minute.

   (a) Express the amount of water that leaks from the pool from time $t = 4$ minutes to time $t = 10$ minutes as a definite integral.

   $$\text{Water} = \int_4^{10} 3e^{-2t}\,dt \quad \text{gallons}$$

   (b) Find the amount of water that leaks from the pool during this time. You may use your calculator to solve the definite integral.

   $$\approx \boxed{0.000503 \text{ gallons}}$$

2. **[2 parts, 1 point each]** The marginal revenue function (in dollars per unit) on sales of q units of a product is given by $R'(q) = 4000 - 3q^2$. The company sells 25 units.

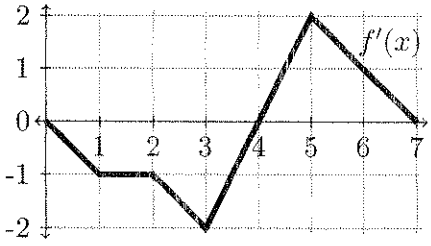
   (a) Express the total revenue as a definite integral.

   $$\text{Total Revenue} = \int_0^{25} (4000 - 3q^2)\,dq \quad \text{dollars}$$

   (b) Find the total revenue. You may use your calculator to solve the definite integral.

   $$= \boxed{\$\,84{,}375}$$

3. **[2 points]** The graph of the derivative $f'(x)$ is shown below. Fill in the table of values given that $f(0) = 4$.



x	0	1	2	3	4	5	6	7
$f(x)$	4	3.5	2.5	1	0	1	2.5	3

4. **[2 points]** Find an antiderivative for the following functions.

(a) $f(x) = 6$

$F(x) = 6x$

(b) $f(t) = 3t - 2$

$F(t) = \frac{3}{2}t^2 - 2t$

(c) $g(x) = x^{\sqrt{2}}$

$G(x) = \frac{1}{\sqrt{2}+1}x^{\sqrt{2}+1}$

(d) $h(y) = y^2 + \frac{1}{y}$

$H(y) = \frac{y^3}{3} + \ln|y|$

5. **[2 points]** Find the following indefinite integrals.

(a) $\int (t^4 + \sqrt{t})\,dt$

$= \frac{t^5}{5} + \int t^{1/2}\,dt$

$= \frac{t^5}{5} + \frac{2}{3}t^{3/2} + C$

(b) $\int \left(3x - \frac{1}{x}\right)\,dx$

$= 3\int x\,dx - \int \frac{1}{x}\,dx$

$= \frac{3}{2}x^2 - \ln|x| + C$

(c) $\int 2e^{5s}\,ds$

$= 2\int e^{5s}\,ds$

$= 2 \cdot \frac{1}{5}e^{5s} + C$

$= \frac{2}{5}e^{5s} + C$

(d) $\int \sqrt{y}(2y+1)\,dy$

$= \int 2y \cdot y^{1/2} + y^{1/2}\,dy$

$= 2\int y^{3/2}\,dy + \int y^{1/2}\,dy$

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

$= \frac{4}{5}y^{5/2} + \frac{2}{3}y^{3/2} + C$