Progress exercise 18.1

(a) $\frac{1}{4}x^4 + c$
(b) $-0.5x^{-2} + c$
(c) $2x^{-0.5} + c$
(d) $0.8x^{1.25} + c$
(e) $4x^{0.25} + c$
(f) $5\ln x + c$
(g) $2e^x + c$
(h) $x^5 + e^x - 8x^{0.5} + c$
(i) $-0.5x^{-4} + 3x^3 + 0.625x^{1.6} + c$
(j) $6x^{5/3} - 0.5\ln x + c$
(k) $1000e^{0.1x} + c$
(l) $-200e^{-0.05x} + c$
(m) $(2x^2 + \ln x)^4 + c$
(n) $\frac{2}{3}(x^{0.5} + 6x + 5)^{3/2} + c$
(o) $\ln(x^4 + 5x^2 - 2e^x) + c$
(p) $xe^x - e^x + c$
(q) $0.5xe^{2x} - 0.25e^{2x} + c$

Progress exercise 18.2

(1) 2500 (2) 2.9957 (3) 108 (4) 126.4241 (5) 6811.5333

(6) 187.112 (7) e (8) 1

Progress exercise 18.3

1. To answer this, we find the definite integral of 4 + 4*q* from 25 to 50. Answer is 3850.
2. To answer this, we find the definite integral of *MR* from 144 to 400, which equals 4000. So answer is –4000; that is, a loss.
3. To answer this, we first find the consumer's valuation, which is the area under the inverse demand curve between *q* = 0 and *q* = 8. This is

$$\int_0^8 (100 - q^2)\,dq = 629\tfrac{1}{3}$$

Then we subtract what the consumer has to pay for 8 units. When *q* = 8, then from the inverse demand function $p = 100 - q^2$ we have *p* = 36. So consumer pays 8 × 36 = 288 for 8 units. Her consumer surplus is therefore

$$629\tfrac{1}{3} - 288 = 341\tfrac{1}{3}$$

4. The *PV* is the integral: $PV = \int_0^x ae^{-rx}\mathrm{d}x$. This can be written as

$PV = \frac{a}{r}(1 - e^{-rx})$ (see rule 18.6 and 18.6A)

5. Expected profit is $10 million per year for 20 years. The present value (PV) of the expected profit (see rule 18.6 and 18.6A), discounted continuously, is

$PV = \int_0^x ae^{-rx}\mathrm{d}x = \frac{a}{r}(1 - e^{-rx})$ million dollars

Where a = expected profit per year, x = number of years, r = discount rate.

(a) Given r = 0.05, with x = 20 and a = 20, PV = $252.85 million
(b) when r = 0.1 , with x = 20 and a = 20, PV = $172.93m (31.3% less than (i))
(c) when r = 0.1, x = 5 and a = 20, PV = $78.69m