**1.** Differentiate.

(a) $g(x) = (x + 5\sqrt{x})e^x$

(b)

$$y = \frac{\sqrt{x}}{2 + x}$$

(c)

$$f(x) = \frac{ax + b}{cx + d}$$

**2.** Find the derivative in two ways: (i) product rule and (ii) first multiply-out.

$f(x) = (x + x^2)(x^{-1} + 3)$

**3.** A quantity $p$ of fabric, measured in yards, is sold at a price $f(p)$ (dollars) which depends on the quantity. The total revenue from a sale of $p$ yards of fabric is $R(p) = pf(p)$.

(a) What does it mean to say that $f(20) = 100$ and that $f'(20) = -0.5$?

(b) Assuming the values in part (a), find $R'(20)$ and interpret your answer.

**4.** Consider these facts:

- $\csc x = 1/\sin x$
- $\cot x = \cos x/\sin x$
- $(\sin x)' = \cos x$

Use the quotient rule and the above facts to show that

$$\frac{d}{dx}(\csc x) = -\csc x \cot x$$

**5.** Differentiate $f(\theta) = \theta \cos\theta \sin\theta$.