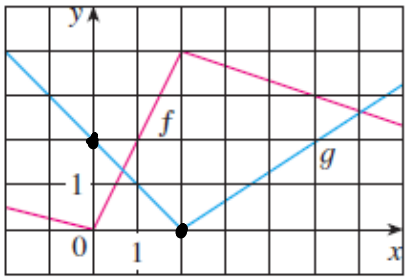
47. If f and g are the functions whose graphs are shown, let $u(x) = f(x)g(x)$ and $v(x) = f(x)/g(x)$.

(a) Find $u'(1)$. (b) Find $v'(5)$.



$u' = f'g + gf$

$f(1) = 2$

$f'(1) = 2$

$g(1) = 1$

$g'(1) = -1$

$u'(1) = f'(1)g(1) + g'(1)f(1)$

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

$= 0$

49. If g is a differentiable function, find an expression for the derivative of each of the following functions.

(a) $y = xg(x)$ (b) $y = \dfrac{x}{g(x)}$ (c) $y = \dfrac{g(x)}{x}$

$y' = 1 \cdot g(x) + g'(x) \cdot x$

$= g(x) + x\,g'(x)$

43. Suppose that $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$, and $g'(5) = 2$. Find the following values.

(a) $(fg)'(5)$ (b) $(f/g)'(5)$

(c) $(g/f)'(5)$

$f'(5)g(5) + g'(5)f(5)$

$= (6)(-3) + (2)(1) = -16$

33–34 Find equations of the tangent line and normal line to the given curve at the specified point.

33. $y = \underbrace{2x}_{f}\underbrace{e^x}_{g}$, $(0, 0)$

34. $y = \dfrac{\sqrt{x}}{x+1}$, $(4, 0.4)$

$y' = 2e^x + e^x(2x)\Big|_{x=0} = 2e^0 + e^0(2\cdot 0) = 2$

$y' = f'g + g'f$

eq. of Tangent line

$y - 0 = 2(x - 0)$

eq. of NL

$y = -\frac{1}{2}x$

45. If $f(x) = e^x g(x)$, where $g(0) = 2$ and $g'(0) = 5$, find $f'(0)$.

$$f' = e^x g(x) + g'(x)e^x$$

$$f'(0) = e^0 g(0) + g'(0)e^0 = 1 \cdot 2 + 5 \cdot 1 = 7$$