

#15, 16, 65-71 odd, 72-76 even, 80, 89, 91, 99-104, 105

15) f is cubic function
 f' is parabola

16) f is graph above x -axis
 f' is graph crossing x -axis

65) $f(x) = \sqrt{1-x^3}$
 $f'(x) = \frac{1}{2}(1-x^3)^{-1/2}(-3x^2)$
 $f'(x) = \frac{-3x^2}{2\sqrt{1-x^3}}$

67) $h(x) = \left(\frac{x-3}{x^2+1}\right)^2$
 $h'(x) = 2\left(\frac{x-3}{x^2+1}\right) \cdot \frac{x^2+1(1) - (x-3)(2x)}{(x^2+1)^2}$
 $= \frac{2(x-3)(x^2+1 - (2x^2-6x))}{(x^2+1)^3}$
 $= \frac{-2(x-3)(-x^2-6x-1)}{(x^2+1)^3}$

69) $f(s) = (s-1)^{5/2}(s^3+5)$
 $= (s^2-1)^{5/2}(3s^2) + (s^3+5)\left(\frac{5}{2}(s^2-1)^{3/2} \cdot 2s\right)$
 $= 3s^2(s^2-1)^{5/2} + 5s(s^3+5)(s^2-1)^{3/2}$
 $= (s^2-1)^{3/2} [3s^2(s^2-1) + 5s(s^3+5)]$
 $(s^2-1)^{3/2} [3s^4 - 3s^2 + 5s^4 + 25s]$
 $s(s^2-1)^{3/2} [8s^3 - 3s + 25]$

71) $y = 3\cos(3x+1)$
 $y' = -3\sin(3x+1)(3)$
 $y' = -9\sin(3x+1)$

73) $y = \frac{1}{2}\csc 2x$
 $y' = -\frac{1}{2}\csc 2x \cot 2x \cdot 2$
 $y' = -\csc 2x \cot 2x$

75) $y = \frac{1}{2}x - \frac{1}{4}\sin 2x$
 $y' = \frac{1}{2} - \frac{1}{4}\cos(2x)(2)$
 $y' = \frac{1}{2} - \frac{1}{2}\cos 2x$
 $y' = \frac{1}{2}(1 - \cos 2x)$

77) $y = \frac{2}{3}\sin^{3/2}x - \frac{2}{7}\sin^{7/2}x$
 $y' = \frac{3}{2} \cdot \frac{2}{3} \sin^{1/2}x \cdot \cos x - \frac{7}{2} \cdot \frac{7}{2} \sin^{5/2}x \cdot \cos x$

$y' = \sin^{1/2}x \cos x - \sin^{5/2}x \cos x$
 $y' = \sin^{1/2}x \cos x (1 - \sin^2x)$
 $y' = \sin^{1/2}x \cos x (\cos^2x)$
 $y' = \sin^{1/2}x \cos^3x$

79) $y = \frac{\sin \pi x}{x+2}$
 $y' = \frac{(x+2)(\cos \pi x)\pi - \sin \pi x}{(x+2)^2}$
 $y' = \frac{\pi(x+2)\cos \pi x - \sin \pi x}{(x+2)^2}$