SOLUTION TO HW 5

1 a) $f(x) = e^{4-3x} \sin(7x^2)$

$$f'(x) = e^{4-3x} \cdot (-3) \sin(7x^2) + e^{4-3x} \cos(7x^2)(14x)$$

$$= e^{4-3x}\left(14x\cos(7x^2) - 3\sin(7x^2)\right)$$

b) $h(t) = \sqrt{7t^2-1}$

$$h'(t) = \frac{1}{2\sqrt{7t^2-1}} \cdot 14t = \frac{7t}{\sqrt{7t^2-1}}$$

c) $f(x) = \dfrac{x+\cos 2x}{(x+1)^3+1}$

$$f'(x) = \frac{(1-\sin 2x \cdot 2)\left((x+1)^3+1\right) - (x+\cos 2x)\left(3(x+1)^2\right)}{\left((x+1)^3+1\right)^2}$$

$$= \frac{1-2\sin 2x}{(x+1)^3+1} - \frac{3(x+1)^2(x+\cos 2x)}{\left((x+1)^3+1\right)^2}$$

d) $a(s) = \tan(s^3) - \tan^3 s$

$$a'(s) = \sec^2(s^3) \cdot 3s^2 - 3\tan^2 s \cdot \sec^2 s$$

$$= 3s^2 \sec^2(s^3) - 3\tan^2 s \sec^2 s$$

e) $$z(r) = \frac{(2r+1)^{3/2}}{r^4+1} \cos\left(5r^2 - e^{2r+3}\right)$$

$$z'(r) = \frac{\left(\frac{3}{2}(2r+1)^{1/2} \cdot 2 \cos\left(5r^2 - e^{2r+3}\right) + (2r+1)^{3/2}\left(-\sin\left(5r^2 - e^{2r+3}\right)\right)\left(10r - e^{2r+3} \cdot 2\right)\right)\left(r^4+1\right) - (2r+1)^{3/2} \cos\left(5r^2 - e^{2r+3}\right)\left(4r^3\right)}{\left(r^4+1\right)^2}$$