

## MAT220 Gateway Review - Solutions

1.
  - a.  $f'(x) = \frac{-2}{\sqrt{1-(2x-1)^2}}$
  - b.  $g'(x) = ax^{a-1} - 5a^x \ln a - \frac{a}{2x^2}$
  - c.  $h(x) = \frac{x^2+2x}{\sqrt{x}} = x^{3/2} + x^{1/2}$ , so  $h'(x) = \frac{3}{2}x^{1/2} + \frac{1}{2}x^{-1/2}$
  - d.  $r'(\theta) = 5 \cos 5\theta \cos 2\theta + 2 \sin(5\theta) \sin 2\theta$
  - e.  $f'(x) = \frac{6x}{2x^3 - 8}$
  - f.  $g'(x) = 24 \sin^2(8x) \cos(8x)$
  - g.  $h'(x) = \frac{10x}{1+25x^4}$
  - h.  $q'(t) = 3e^{3t} \tan(5t) + 5e^{3t} \sec^2(5t) = 3e^{3t} \tan(5t) + \frac{5e^{3t}}{\cos^2(5t)}$
  - i.  $f'(x) = 6x^2 + 3^x \ln 3 - \frac{15}{3x+1} + \ln 3$
  
3.
  - a.  $f(x) = xe^x$  at  $x=0$                        $y = x$
  - b.  $g(x) = x \ln x - 2x$  at  $x=1$                        $y = -x - 1$
  - c.  $h(x) = -5x \cos x$  at  $x=0$                        $y = -5x$
  
4.  $f'(1)=-2, f'(2)=-4, f'(3)=-6, f'(3.5)=-7, f'(4)=-8, f''(1.5)=-2,$   
 $f''(2)=-2, f''(3.5)=-2$
  
6. If  $H(t)$  is the height (in inches) of a child at age  $t$  years, interpret the following statements using plain English and all appropriate units.
  - a.  $H(4)=38$                                       At four years old, this child is 38 inches tall.
  - b.  $H'(4)=1.8$                                       At four years old, this child growing at a rate of 1.8 inches per year.
  - c.  $H'(4)>0$  and  $H''(4)<0$                       At four years old, this child's height is increasing, but at a decreasing rate.

7.

