Example Technology Exercise 2
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1 See Word Document

2 Find the derivatives

2.1 Problem 2.2.49

(%i1) diff(sqrt(x)-6*x^(1/3),x);

(%o1) $\dfrac{1}{2\sqrt{x}} - \dfrac{2}{x^{2/3}}$

2.2 Problem 2.3.55

(%i2) diff((x+1)/(x+2)*(2*x-5),x),factor;

(%o2) $\dfrac{2x^2+8x-1}{\left(x+2\right)^2}$

2.3 Problem 2.3.57

(%i3) diff(theta/(1-sin(theta)),theta),factor;

(%o3) $-\dfrac{\sin(\theta)-\theta\cos(\theta)-1}{\left(\sin(\theta)-1\right)^2}$

trigsimp() and trigreduce() don't make this any prettier

2.4 Problem 2.4.97

(%i4) diff(1/9*(3*x+1)^3,x,2);
      subst(x=1,%);

(%o4) $6\left(3x+1\right)$

(%o5) 24

2.5 Problem 2.5.13

The [1] at the end of the solve command is to return the first solution
rather than an array.

(%i6) depends(y,x)$
diff(sin(x)=x*(1+tan(y)),x);
solve(%,'diff(y,x))[1];

$$(\%o7) \cos\left(x\right)=x\,\sec\left(y\right)^{2}\left(\frac{d}{dx}y\right)+\tan\left(y\right)+1$$

$$(\%o8)\ \frac{d}{dx}y=-\frac{\tan\left(y\right)-\cos\left(x\right)+1}{x\,\sec\left(y\right)^{2}}$$

2.6 Problem 2.5.31

We only need the depends(y,x) statement once per file.
When we substitute the point, we only want to do it to the right hand side
  of the equation.

(%i9) diff((x^2+y^2)^2=4*x^2*y,x);
solve(%,'diff(y,x))[1];
subst([x=1,y=1],rhs(%));

$$(\%o9)\ 2\left(y^{2}+x^{2}\right)\left(2\,y\left(\frac{d}{dx}y\right)+2\,x\right)=4\,x^{2}\left(\frac{d}{dx}y\right)+8\,x\,y$$

$$(\%o10)\ \frac{d}{dx}y=-\frac{x\,y^{2}-2\,x\,y+x^{3}}{y^{3}+x^{2}\,y-x^{2}}$$

$$(\%o11)\ 0$$

Because the slope is 0, there is a horizontal tangent line at (1,1)