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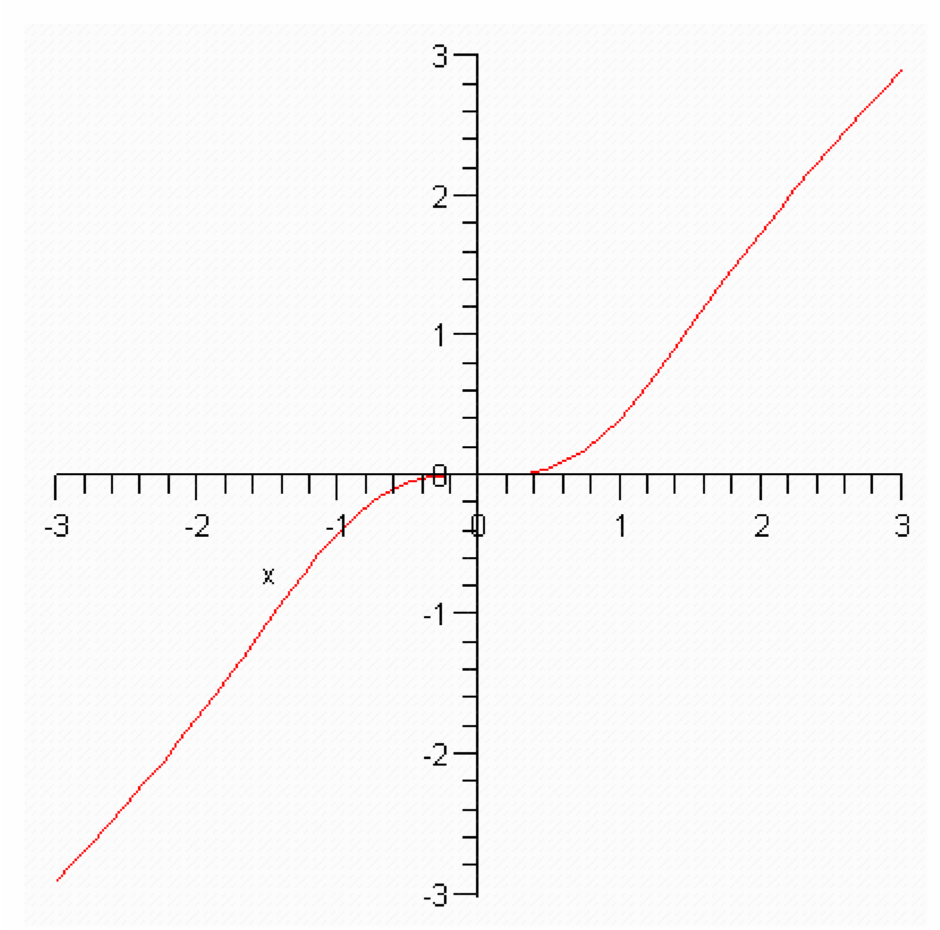
Maple Assignment #2 Solutions

#1 (a)

> $f := x \to \frac{x^3}{sqrt(x^4 + 5)}$

$$f := x \to \frac{x^3}{\sqrt{x^4 + 5}}$$

> $plot(f(x), x = -3 ..3)$



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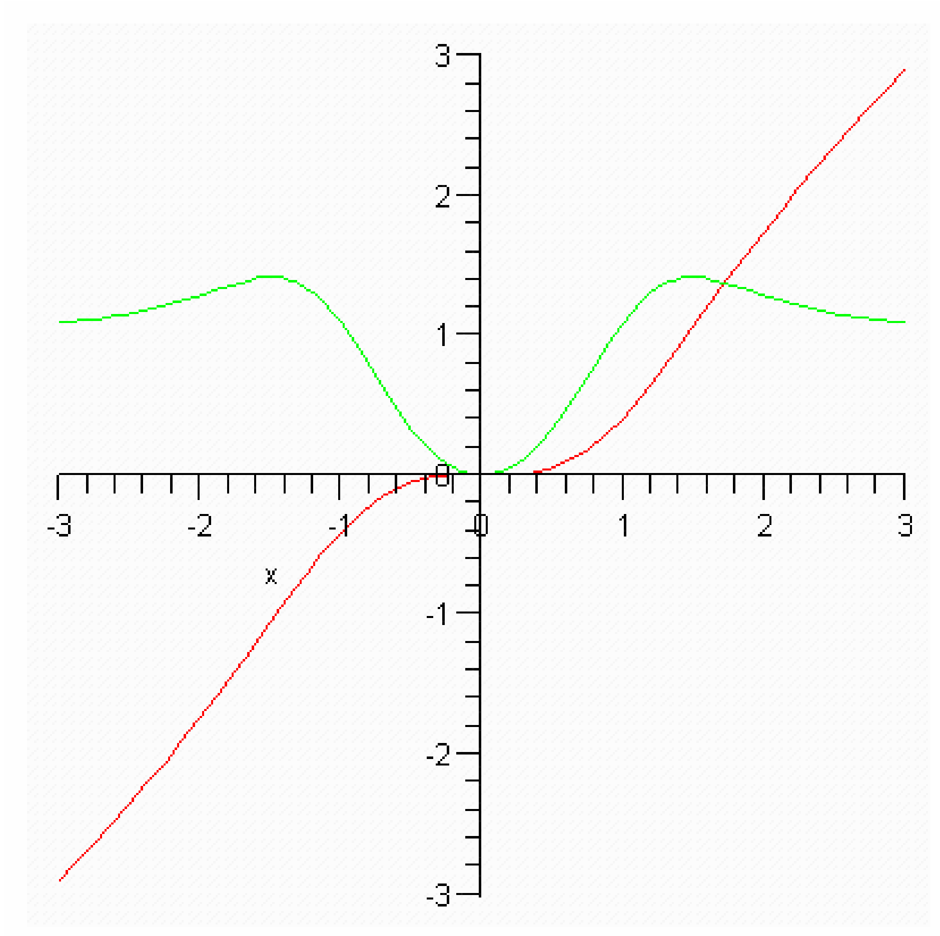
#1 (b)

> $g := x \rightarrow D(f)(x);$

$$g := x \rightarrow (\mathrm{D}(f))(x)$$

> $plot([f(x), g(x)], x = -3..3)$



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#1 (c)

Tangent line at x=1.

> $T1 := x \rightarrow f(1) + g(1) \cdot (x-1)$

$$T1 := x \rightarrow f(1) + g(1)\ (x-1)$$

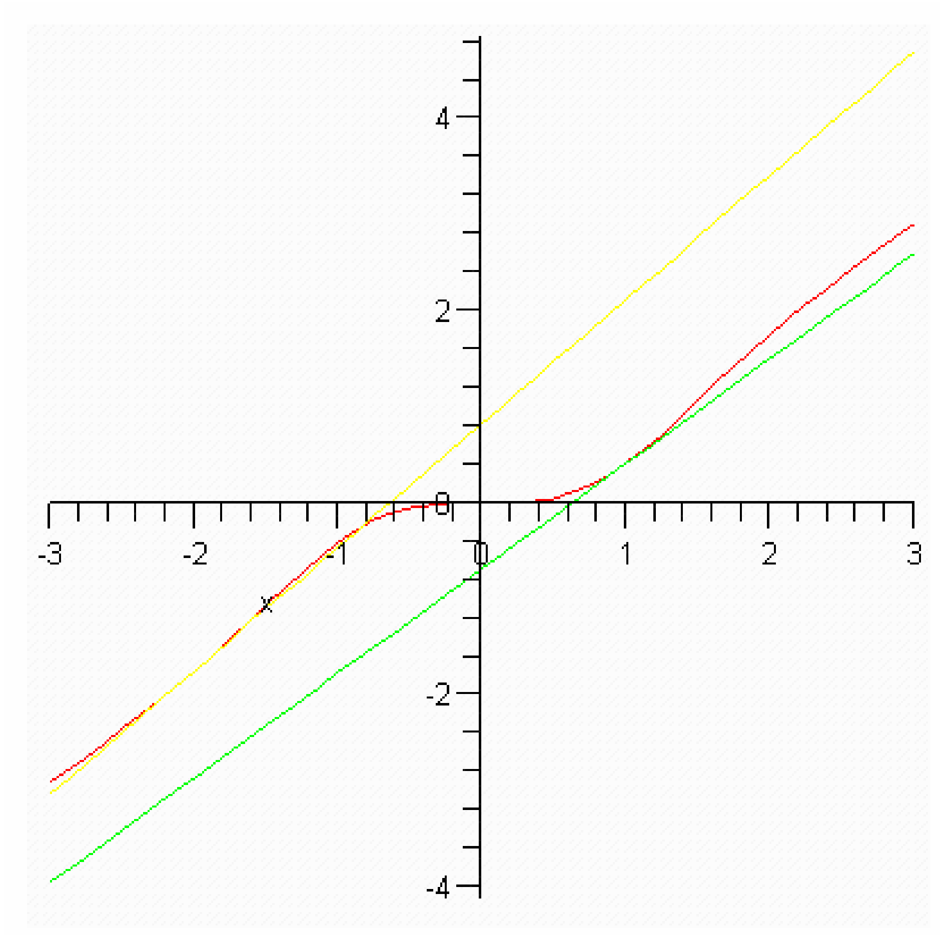
>

Tangent line at x=1.

> $T2 := x \to f(-2) + g(-2) \cdot (x + 2)$

$$T2 := x \to f(-2) + g(-2)\ (x + 2)$$

> $plot([f(x), T1(x), T2(x)], x = -3..3)$



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#2 (a)

> $s := t \to 2 \cdot t^3 - 9 \cdot t^2$

$$s := t \to 2\ t^3 - 9\ t^2$$

> $v := t \to D(s)(t);$

$$v := t \to (\mathrm{D}(s))(t)$$

> $eval(v(t))$

$$6\,t^2 - 18\,t$$

> $a := t \rightarrow D(v)(t);$

$$a := t \rightarrow (\mathrm{D}(v))(t)$$

> $eval(a(t))$

$$12\,t - 18$$

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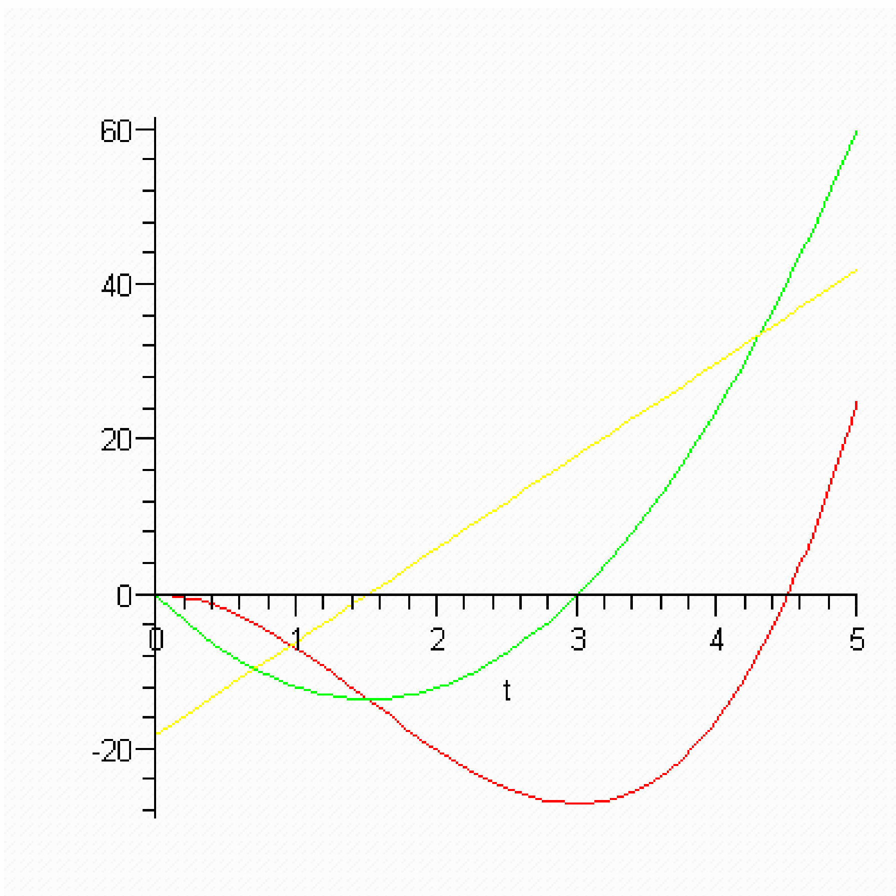
#2 (b)

> $plot([s(t), v(t), a(t)],\; t = 0..5)$



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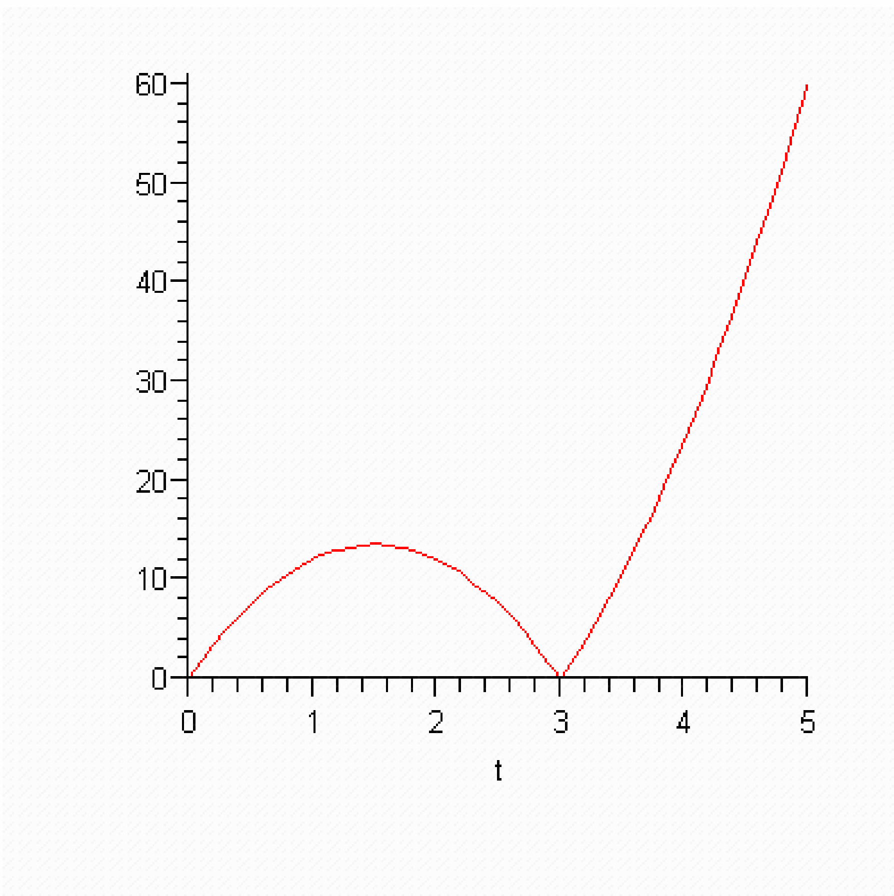
#2 (c)

For 0 <= t <= 1.5, particle is speeding up since velocity is decreasing and negative, hence moving away from zero in a negative direction. Hence the particle is moving left and speeding up. Note that acceleration is negative during these times.
For 1.5 <= t <= 3, particle is slowing down since velocity is increasing from negative values to zero. Note that acceleration is positive during these times.
For 3 <= t <= 5, particle is speeding up since velocity is positive and increasing. Note that acceleration is positive during these times.

An easier way to see this (perhaps) is to look at a graph of the particle's speed:

> $plot(|v(t)|,\ t = 0\,..5)$



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For 0 <= t <= 1.5, speed is increasing, so speeding up.
For 1.5 <= t <= 3, speed is decreasing, so slowing down.
For 3 <= t <= 5, speed is increasing again so speeding up.