MAT128, Quiz 6 Key

Name:

1. (4 pts) Suppose we were to use the limit definition to compute the derivative of cosine. The first step would be to write

$$\cos'(x) = \lim_{h \to 0} \frac{\cos(x+h) - \cos(x)}{h}$$

What would be the next step?

In[2463]:=
```
TrigExpand[Cos[x + h]]
```

Out[2463]=
```
Cos[h] Cos[x] - Sin[h] Sin[x]
```

2. (2 pts) Compute the derivative of

$$f(t) = 3\cos(t) - 4\sin(t)$$

In[2464]:=
```
f[t_] := 3 Cos[t] - 4 Sin[t]
f'[t]
```

Out[2465]=
```
-4 Cos[t] - 3 Sin[t]
```

3. (4 pts) Determine the local linearization to $f(t) = 3\cos(t) - 4\sin(t)$ at $t = \dfrac{\pi}{2}$, and use it to estimate the value $f(1.5)$. How well does the estimate do?

In[2466]:=
```
a = Pi / 2;
localLinearization[x_] := f[a] + f'[a] (x - a)
Print["local linearization:"];
localLinearization[t]
Print["local linearization L(t) at (t=Pi/2):"];
localLinearization[1.5]
Print["Actual value:"];
f[1.5]

Plot[{localLinearization[x], f[x]}, {x, a - 1, a + 1}, PlotLabels → Automatic]
```

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local linearization:
```

Out[2469]= $-4-3\left(-\frac{\pi}{2}+t\right)$

```
local linearization L(t) at (t=Pi/2):
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Out[2471]= −3.78761101961531

```
Actual value:
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Out[2473]= −3.77776834141311

Out[2474]=