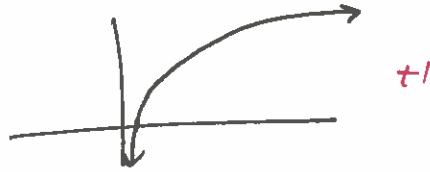


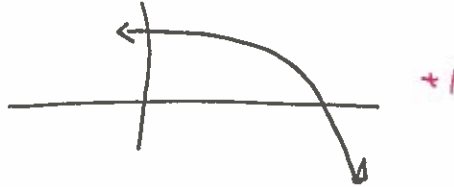
II

2/2

(a) f' pos + decreasing



(b) f' neg + decr.



2

8/8

(a)

$$s(t) = -0.325t^2 - 20t$$

$$s'(t) = -0.65t - 20$$

$$s''(t) = -0.65$$

i) velocity: $s'(t) = -0.65t - 20$ +1
 accel: $s''(t) = -0.65$

ii) $s(0) = 0$, so the tower height is 0 ft, object thrown from the ground. +1

iii) $v(0) = s'(0) = 0 - 20 = -20$, thrown down. +1

iv) $\frac{-0.65}{-9.8} \approx 0.066$ times the strength on Earth. +1

(b)

$$s(t) = -137t^2 + 20t + 500$$

$$s'(t) = -274t + 20$$

$$s''(t) = -274$$

i) velocity: $s'(t) = -274t + 20$ +1
 accel: $a(t) = -274$. +1

ii) $s(0) = 500$, so tower was 500 feet tall. +1

iii) $v(0) = 20$, so it is thrown up. +1

iv) $\frac{274}{9.8} \approx 27.96$ times the strength of gravity on Earth. +1

3 Note: problem had a typo; if students found everything correctly with $F(t) = t^4 \cdot e^2$, give full credit.

6/6

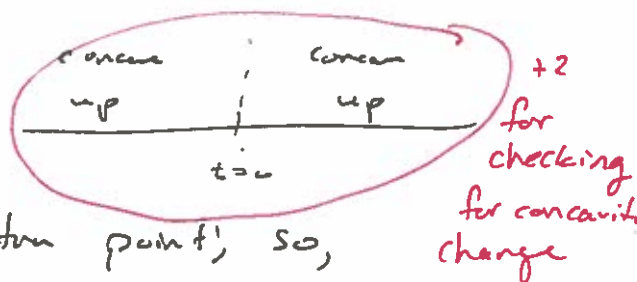
with typo: $F(t) = t^4 \cdot e^2$
 $F'(t) = 4t^3 e^2$
 $F''(t) = 12t^2 e^2$.

Crit pts: $t = 0$ (+1)

Possible Infl. pts: $t = 0$ again;
 +1 for getting number

$\Rightarrow t = 0$ is not an inflection point, so,

no inflection pts.



* Concave down: nowhere (+1)

* concave up: $(-\infty, 0) \cup (0, \infty)$ (all reals is acceptable) (+1)

Correct function: $F(t) = t^3 e^{2t}$.

$$F'(t) = 3t^2 e^{2t} + 2t^3 e^{2t} = (2t^3 + 3t^2) e^{2t}$$

$$F''(t) = (2t^3 + 3t^2) \cdot 2e^{2t} + (6t^2 + 6t) e^{2t}$$

$$F''(t) = \cancel{2t^3 + 3t^2} + \cancel{2t^3 + 3t^2} + \cancel{6t^2 + 6t} = (4t^3 + 12t^2 + 6t) e^{2t}$$

Crit. pts:

$$2t^3 + 3t^2 = 0$$

$$t^2(2t + 3) = 0 \rightarrow \boxed{t = 0} \text{ and } \boxed{t = -\frac{3}{2}}$$

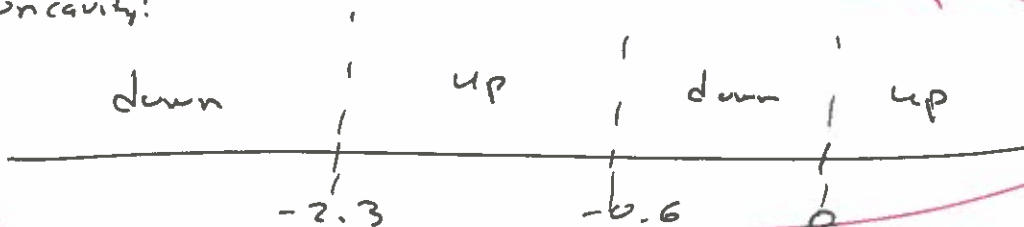
(+1) total

Possible Inflection pts: ~~4~~ $t^3 + 12t^2 + 6t = 0$

$$t(\del{4}t^2 + 12t + 6) = 0$$

Get: $t = 0$, $t \approx -2.3660$
 $t \approx -0.62297$. } +1 for finding these

Concavity:



+2 for checking concavity changes

\Rightarrow all three are inflection points.

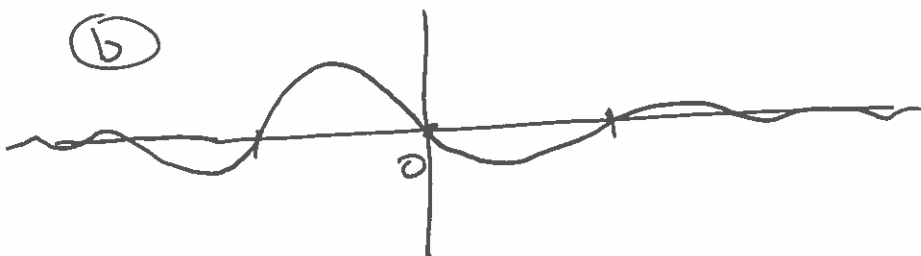
Concave ~~up~~ down: $(-\infty, -2.366) \cup (-0.6, 0)$ +1

Concave up: $(-2.366, -0.6) \cup (0, \infty)$. +1

4 (a) $\text{sinc}'(x) = \frac{x \cos(x) - \sin(x)}{x^2}$ +2

4/4

(b)



Possible values: $0, 4.49, 7.73, 10.904, \dots$
and negatives.

+2

表