Review Practice Problems 3.1 – 3.4

2. $f'(x) = \dfrac{1}{2\sqrt{x+2}}$

$f''(x) = \dfrac{-1}{4(x+2)\sqrt{x+2}}$

$f'(x) = \dfrac{-3}{(x+2)^2}$

$f''(x) = \dfrac{6}{(x+2)^3}$

$f'(x) = \dfrac{1}{\sqrt[3]{x^2}}$

$f''(x) = -\dfrac{2}{3x\sqrt[3]{x^2}}$

$f'(x) = -\dfrac{3}{x^{7/4}} + \dfrac{1}{2x^{3/4}}$

$f''(x) = \dfrac{3}{4x^{7/4}} - \dfrac{3}{8x^{7/4}}$

$f'(x) = -\dfrac{4}{x^3} - 12x^2$

$f''(x) = \dfrac{12}{x^4} - 24x$

$f'(x) = \dfrac{9x^4 - 3x^2}{x^2} = 9x^2 - 3$

$f''(x) = 18x - 3$

$f'(x) = 6x^2 + 22x + 17$

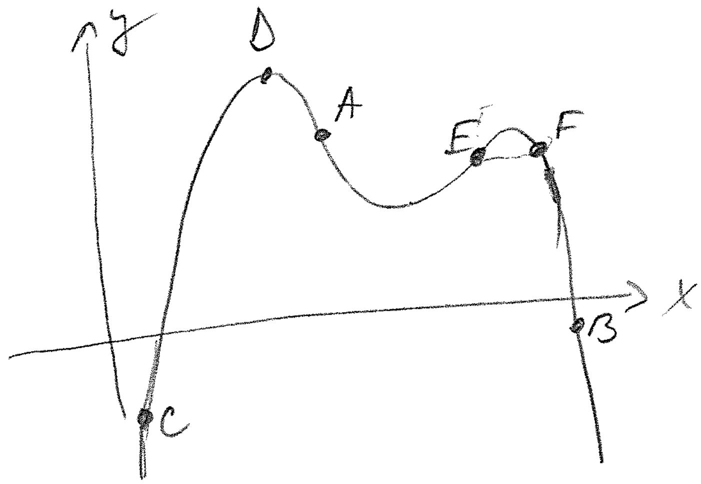
$f''(x) = 12x + 22$

$f'(x) = \dfrac{-2x + 15}{x^4}$

$f''(x) = \dfrac{6}{x^4} - \dfrac{60}{x^5}$

3. $\lim_{x \to -3} \frac{g(x) - g(-3)}{x+3}$ = slope of the tangent line at $x = -3$

$= -\frac{1}{3}$



4. $f(x)$ has a horizontal tangent where $f'(x) = 0$

$f'(x) = 3x^2 + 1 = 0$ there are no real value of x where $f(x)$ has a horizontal value.

5. $f'(x) = -\frac{3}{2x^{7/4}}$ and $f'(1) = -\frac{3}{2} = m.$

at $x = 1$ $y = g(x) = 2$ so one point on the tangent is $(1, 2$

$y - 2 = -\frac{3}{2}(x-1)$ is the equation of the tangen to $g(x)$ at $x = 1$

6. Slope of the tangent $= f'(x)$

$4 = 2x - k$

$x = \frac{4+k}{2}$

Let (x, y) be the point where the tangent is ~~i~~ touching $f(x)$

for this point $4x - 9 = x^2 - kx$

$\therefore k = 2$ and $k = -10$

Product rule

7\. a) $\frac{d}{dx}(uv) = uv' + u'v$

$= 5 \cdot 2 + (-3) \cdot (-1) = 13$

Quotient Rule

b) $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \cdot u' - u \cdot v'}{v^2} = \frac{-1(-3) - 5(2)}{(-1)^2} = -7$

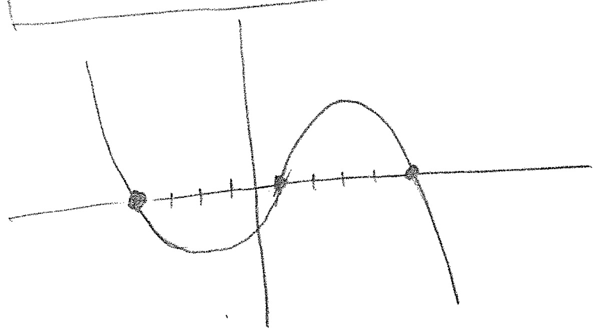
Quotient Rule

c) $\frac{d}{dx}\left(\frac{v}{u}\right) = \frac{u \cdot v' - v \cdot u'}{u^2} = \frac{5 \cdot 2 - (-1)(-3)}{5^2} = \frac{7}{25}$

d) $\frac{d}{dx}(7v - 2u) = 7v' - 2u' = 7 \cdot (2) - 2 \cdot (-3) = 20$

8\.

	$F'(x)$	$F(x)$
Is $= 0$	at $x = -4$, $x = +1$, $x = 5$	at $x = -6$, $x = -1.5$, $x = 3.2$, $x = 6.8$
Is > 0	$(-\infty, -4) \cup (1, 5)$	$(-6, -1.5) \cup (3.2, 6.8)$
Is < 0	$(-4, 1) \cup (5, \infty)$	$(-\infty, -6) \cup (-1.5, 3.2) \cup (6.8, \infty)$
changes from + to −	at $x = -4$ and $x = 5$	at $x = -1.5$ and $x = 6.8$
changes from − to +	at $x = 1$	at $x = -6$ and $x = 3.2$



9. D

10. a) At the beginning of the motion, at $t=0$ the object is at ~~location~~ location $(-5, 2)$ and moves in the positive direction. At $t = 1.15$ sec the object turns around and moves in the negative direction for 2.03 seconds. At $t = 1.15$ sec its position is $(6.15, 2)$. At $t = 3.18$ sec the object is at position $(-2.19, 2)$, and turns around again moving in the positive direction and continues in this direction indefinitely.

b) The particle speeds up as the slope of $X(t)$ increases and it slows down as the slope of $X(t)$ decreases. Therefore, particle speeds up during times of interval $(1.15, 2.17) \cup (3.18, -$
particle slows down during times of interval. $(0, 1.15) \cup (2.17, 3.18)$

c) Particle changes direction at $t = 1.15$ sec and $t = 3.18$ sec

d) Particle is at rest just as it turns around at. $t = 1.15$ sec and $t = 3.18$ sec.

e) The velocity is positive and decreasing for time $\in (0, 1.15)$ then the velocity become negative and increasing for time $\in (1.15, 2.17)$. From 2.17 to 3.18 velocity remains negative but decreases until it becomes zero at $t = 3.18$ sec. For $t \in (3.18, \infty)$ velocity is positive and it gets larger and larger.

f) at $t=0$

11. $S = 490t^2$ (cm)

a) $S = 160$ cm

$160 = 490t^2$ $t = \pm\frac{4}{7}$ sec.

negative time does not make sense in the context of the problem since motion starts at $t=0$

It took $4/7$ sec to drop 160 cm.

$V_{avg} = \frac{160}{4/7} = 280$ cm/sec

b) This question deals with instantaneous velocity given by s' $V_{(t)} = s' = 980t$

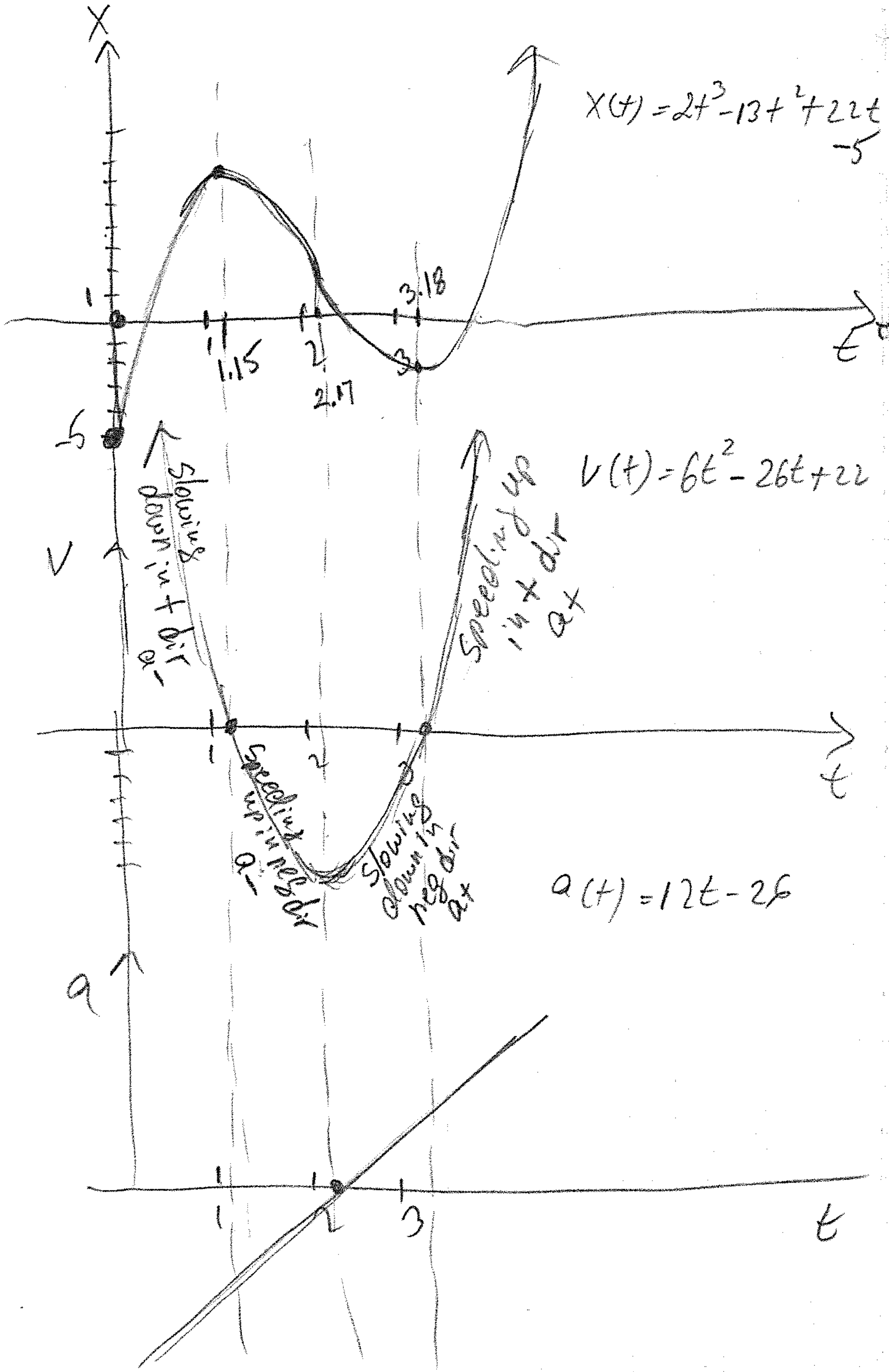
$V(4/7) = 980 \cdot \frac{4}{7} = 560$ cm/sec.

$a = s'' = 980$ cm/sec^2

See book page 139 #38

c) $28 \frac{\text{flashes}}{\text{sec}}$ $16 \div 4/7$

16 shown positions in $\frac{4}{7}$ sec



X
x(t) = 2t³ - 13t² + 22t - 5
1
-5
1.15
2.17
3.18
t
v(t) = 6t² - 26t + 22
v
slowing down in + dir
a-
speeding up in + dir
a+
speeding up in neg dir
a-
slowing down in neg dir
a+
t
a(t) = 12t - 26
a
1
2
3
t