1. [1 each] Determine whether or not the following statements are true or false. If they are **always** true circle **T**. If they are not **always** true, circle **F**.

2.6.55.d (a) (T) (F) Suppose f is continuous on $[a,b]$. Then there is a point c in (a,b) such that $f(c) = [f(a)+f(b)]/2$.

3.1.47.d (b) (T) F If the function f is differentiable for all values of x, then f is continuous for all values of x.

3.2.47.b (c) (T) F The slope of a line tangent to $f(x) = e^x$ is never 0.

3.5.25.a (d) T (F) If the acceleration of an object remains constant, then its velocity is constant.

2.6.55.a (e) (T) F If a function if left-continuous and right-continuous at a, then it is continuous at a.

2.6.21 2. [10] Find the intervals on which the following functions are continuous:

(a) $f(x) = \dfrac{x^5+6x+17}{x^2-9} = \dfrac{x^5+6x+17}{(x-3)(x+3)}$ = rational function

$(-\infty, -3)$, $(-3, 3)$, $(3, \infty)$

2.6.35 (b) $f(x) = \sqrt{2x^2-16}$

$2x^2 - 16 \geq 0$

$2x^2 \geq 16$

$x^2 \geq 8$

$|x| \geq \sqrt{8} = 2\sqrt{2}$

$(-\infty, -2\sqrt{2}]$, $[2\sqrt{2}, \infty)$

or $(-\infty, -\sqrt{8}]$, $[\sqrt{8}, \infty)$

3.3.55 3. [9] Find $f'''(x)$ for $f(x) = x^2e^{3x}$ Use product rule 3 times, or use

$(gh)''' = g'''h + 3g''h' + 3g'h'' + gh'''$ (see 3.3.82)

$= (x^2)'''(e^{3x}) + 3(x^2)''(e^{3x})' + 3(x^2)'(e^{3x})'' + (x^2)(e^{3x})'''$

$= (0)(e^{3x}) + 3(2)(3e^{3x}) + 3(2x)(9e^{3x}) + (x^2)(27e^{3x})$

$= e^{3x}(18 + 54x + 27x^2)$

$= 9(3x^2+6x+2)e^{3x}$